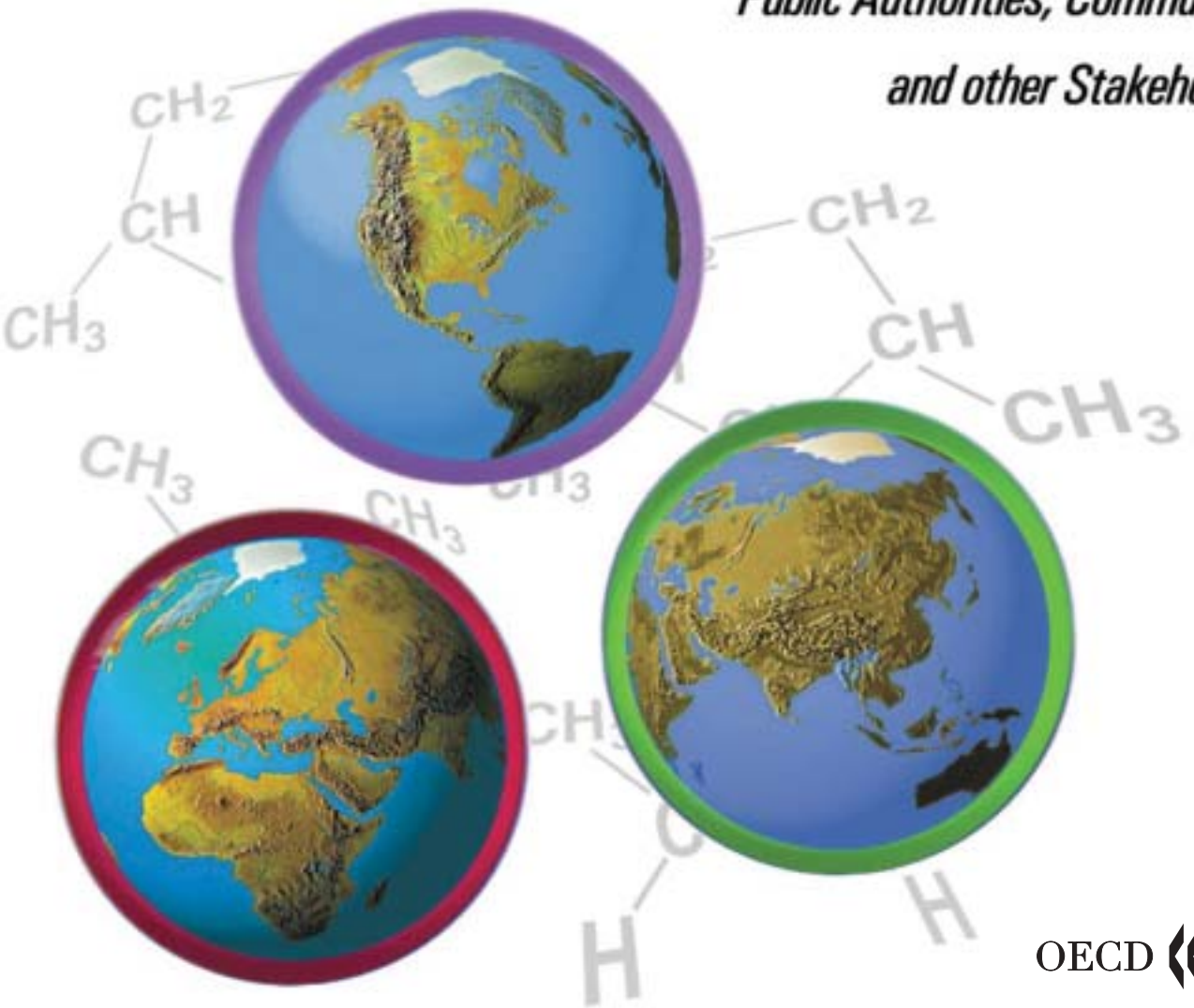
OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response

Guidance for Industry (including Management and Labour), Public Authorities, Communities and other Stakeholders



OECD

IOMC

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OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response

Guidance for Industry (including Management and Labour), Public Authorities, Communities, and other Stakeholders

- Second edition -

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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PREFACE

The chemicals industry produces many useful products without which modern society would not function as it currently does. But the production, storage, transport, use and disposal of chemicals may also involve risks, and can lead to major accidents. The whole of a town can be threatened by an explosion in a chemical plant, the whole of a coast by the shipwreck of a tanker, the whole of a region by leaks from a chemical installation. Bhopal (1984) was the scene of the accident with the most human casualties; the Basel warehouse fire (1986) caused large-scale pollution of the Rhine; and the Baia Mare spill (2000) severely threatened the Danube River. Recently the populations and the towns of Enschede (2000) and Toulouse (2001) were seriously affected by chemical explosions.

At the 1988 OECD Conference on Accidents Involving Hazardous Substances, Ministers initiated an ambitious OECD programme in this field. The programme has developed four Council Acts which have helped to shape the policies concerning major accidents in member countries. Furthermore, the *Guiding Principles for Chemical Accident Prevention, Preparedness and Response* were published in 1992. In the preparation of this document, experts from government, industry, trade unions, environmental interest groups and other international organisations worked closely together. The application of the *Guiding Principles* is the subject of an OECD Council Recommendation; they have been translated into many languages, and are also used widely in non-member countries.

Over the last ten years, governments and industry have focussed on the implementation of these Guiding Principles. At the same time, the OECD Working Group on Chemical Accidents has worked on improving and updating them based on new experiences and on expanding them by introducing new topics. This was done through an extensive series of OECD workshops with participation from the stakeholders. As a result this second edition of the *Guiding Principles* now includes new elements addressing additional topics such: as the development of a health infrastructure to deal with chemical accidents; implementation of the principles by small and medium-sized enterprises; chemical safety at transport interfaces, such as port areas; the safety of pipelines; integrated management of health, environment, safety and quality control; guidance for audits and inspections; and application to sabotage and terrorism.

This second edition of the *Guiding Principles* will help, even more than the original principles, public authorities, industry and communities worldwide to prevent chemical accidents and improve preparedness and response, should an accident occur. I think that this document is an excellent example of how OECD can bring together experts from many sectors of society in order to produce a very practical instrument which will be of value to many in member and non-member countries alike. This document will certainly become an important milestone on the path to improved chemical safety in the world.



Deputy Secretary-General of the OECD

ACKNOWLEDGEMENTS

This second edition of the OECD *Guiding Principles for Chemical Accident Prevention, Preparedness and Response* was prepared by a Drafting Group under the auspices of the Working Group on Chemical Accidents that manages the OECD Programme on Chemical Accidents. The development of the *Guiding Principles* has been undertaken in co-operation with other international organisations active in the area of chemical accident prevention, preparedness and response, including ILO, IMO, UNECE, UNEP, UNOCHA (UNEP/OCHA Joint Environment Unit) and WHO.

The OECD *Guiding Principles* benefited from the extensive knowledge and experience of members of the Drafting Group, which consisted of representatives of OECD member and observer countries, the European Commission, industry, labour, non-governmental organisations and other international organisations. The Group met six times between 1999 and 2002, at the kind invitation of Canada, Italy, the US and the European Commission. Members of the Drafting Group were Wayne Bissett, Eric Clément, Jean-Paul Lacoursière and Robert Reiss (Canada); Jukka Metso (Finland); David Hourtolou and Olivier Salvi (France); Erika Moch and Jorg Steinbach (Germany); Roberta Gagliardi, Gian Carlo Ludovisi and Raffaele Scialdoni (Italy); Soon-Joong Kang, Jae-Hyyn Kim and Hyuck Myun Kwon (Korea); Gunnar Hem (Norway); Mieczyslaw Borysiewicz and Barbara Kucnerowicz Polak (Poland); Josef Skultety (Slovak Republic); Juan Pablo Perez Sanchez (Spain); Äke Persson (Sweden); David Bosworth (UK); Kim Jennings, Kathy Jones and Jim Makris (US); Juergen Wettig (European Commission); Sigal Blumenfeld (Israel); Apostolos Paralikas (EEB); Fritz Balkau and Ruth Do Coutto (UNEP); Patricia Charlebois and Vladimir Sakharov (UNOCHA); Kersten Gutschmidt (WHO-IPCS); Simon Cassidy (BIAC); and Reg Green (TUAC).

Francine Schulberg (OECD Consultant) was responsible for writing and editing the document. Peter Kearns, Béatrice Grenier and Marie-Chantal Huet (OECD Secretariat) assumed an oversight role throughout the process, under the supervision of Robert Visser. The document was edited by Beatrix de Koster.

At the end of the process of preparation of the *Guiding Principles*, an extensive commenting round of the final draft and a special review meeting were organised. The document benefited from comments from experts worldwide. Participants in this peer review included Nestor H. Sposito (Argentina); Jose A. Coelho and Cesar A. Leal (Brazil); Wayne Bissett, Jean-Paul Lacoursière and Robert Reiss (Canada); Olivier Salvi (France); Mark Hailwood (Germany); Apostolos Paralikas and Elias Sampatakakis (Greece); Elena Floridi, Roberta Gagliardi, Gian Carlo Ludovisi and Raffaele delle Piane (Italy); Hyuck Myun Kwon (Korea); Luis Hector Barojas Weber (Mexico); Gerard Lommers (the Netherlands); Gunnar Hem (Norway); Manuel Bouza Serrano (Portugal); Henrieta Lefflerova (Slovak Republic); Garcia Ara, Gonzalo del Castillo, Marisol Lorente, Francisco Perez, Agata ML Puente Rubio and Olga Sanahuja (Spain); Äke Persson (Sweden); Bernard Gay (Switzerland); David Bosworth, Simon Cassidy, Reg Green, Elisabeth Schoffield (UK); Kim Jennings, Kathy Jones, Dorothy McManus, Jim Makris and twenty other reviewers (US); Juergen Wettig (EC); Fritz Balkau, Ruth Do Coutto, James Kamara, David Thwaites and Jiang Yangpin (UNEP).

The web-based, interactive version of the *Guiding Principles* was developed with the support of the US EPA (lead by Kim Jennings) with the assistance of Francine Schulberg.

A brochure for the promotion of the *Guiding Principles* and the related *Guidance on Safety Performance Indicators* was prepared thanks to Dana Robinson, Kim Jennings, Kathy Jones and Francine Schulberg.

The preparation of the *Guiding Principles* was made possible by extra-budgetary contributions from Austria, Canada, Finland, Germany, the Netherlands, Norway, Switzerland and the US.

This publication is dedicated to the memory of Jim Makris, for his leadership, enthusiasm, and dedication to international co-operation regarding chemical accident prevention, preparedness and response and, more specifically, to the OECD Chemical Accidents Programme and the development of these Guiding Principles.

ABOUT THE OECD AND THE IOMC

The Organisation for Economic Co-operation and Development (OECD) is an intergovernmental organisation in which representatives of 30 industrialised countries (from Europe, North America, and the Pacific) and the European Commission meet to co-ordinate and harmonise policies, discuss issues of mutual interest, and work together to respond to international concerns. Most of the OECD's work is carried out by more than 200 specialised committees and subsidiary groups made up of member country delegates. Observers from several countries with special status at the OECD, and from interested international organisations, attend many of the OECD's meetings. Committees and subsidiary groups are served by the OECD Secretariat, located in Paris, France, which is organised into Directorates and Divisions.

The work of the OECD related to chemical accident prevention, preparedness and response is carried out by the Working Group on Chemical Accidents (WGCA), with Secretariat support from the Environment, Health and Safety (EHS) Division of the Environment Directorate.[1] The objectives of the Chemical Accidents Programme include development of guidance materials related to chemical accident prevention, preparedness and response, exchange of information and experience, and analysis of specific issues of mutual concern in OECD member countries. In this context, more than fifteen workshops and special sessions have been held since 1989.

As part of its work on chemical accidents, the OECD has issued several Council Decisions and Recommendations (the former legally binding on member countries), as well as numerous Guidance Documents and technical reports. Additional publications include the *Guidance on Safety Performance Indicators* (to be published in 2003); *Guidance Concerning Chemical Safety in Port Areas* (a joint effort with the IMO); *Guidance Concerning Health Aspects of Chemical Accidents*; the joint OECD/UNEP/OCHA *International Directory of Emergency Response Centres*; and reports of the various workshops.

This publication was produced within the framework of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC). The IOMC was established in 1995 by UNEP, ILO, FAO, WHO, UNIDO and the OECD (the Participating Organisations), following recommendations made by the 1992 UN Conference on Environment and Development to strengthen co-operation and increase international co-ordination in the field of chemical safety. UNITAR joined the IOMC in 1997 to become the seventh Participating Organisation. The purpose of the IOMC is to promote co-ordination of the policies and activities pursued by the Participating Organisations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.

Obtaining OECD Publications: The OECD *Guiding Principles for Chemical Accident Prevention, Preparedness and Response* is available electronically, at no charge. For the complete text of this and many other EHS publications, consult the OECD's web page (www.oecd.org/ehs/) or contact: OECD Environment Directorate (Environment, Health and Safety Division), 2 rue André-Pascal, 75775 Paris Cedex 16, France. Fax: (33) 1 45 24 16 75. E-mail: ehscont@oecd.org.

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TO ASSIST THE READER

This is the second edition of the OECD *Guiding Principles*. It is available in both hard copy and on the OECD website. There are a number of changes - both in format and content - from the first edition. This edition is divided into five main parts, following the introduction. These five parts address:

A. **Prevention**: including all aspects of managing, operating, and controlling a hazardous installation, from its conception to its decommissioning/demolition.
B. **Preparedness/Mitigation**: focusing on preparedness planning, communication with the public, and land-use planning/siting of installations.
C. **Response**: addressing all the actions to be taken once an accident has occurred or there is an imminent threat of an accident, including mitigating adverse effects on health, the environment and property.
D. **Follow-up to Incidents**: including reporting, investigations and medical follow-up activities.
E. **"Special Issues":** providing additional guidance related to transboundary/international issues and to transport involving fixed facilities (*i.e.*, fixed installations involved in the transport of hazardous substances such as pipelines, port areas, and railroad marshalling yards and other transport interfaces).

(**NOTE**: This guidance applies to all hazardous installations, irrespective of size. However, to facilitate its use in small and medium-sized enterprises (SMEs), a text box at the end of Chapter 1 highlights certain points that might be of particular concern to SMEs and others who work with SMEs.)

Six Annexes are included to help readers use this publication:

An **Explanation of Terms Used** (Annex I). *For proper understanding of the* Guiding Principles, *it is important to consult this Annex*. It should be noted, however, that the terms included have been defined to facilitate understanding and use of this publication only, *and should not be taken as generally agreed definitions or as terms that have been harmonised between countries and organisations*.

A **List of Acronyms** (Annex II) gives the full name of the most common acronyms used in the context of chemical accident prevention, preparedness and response.

A **Key Word Index** (Annex III) has been designed to help the reader locate paragraphs that address a particular subject or party. The cross-references in this Annex refer to related (although not necessarily identical) concepts. In using the Index, it should be kept in mind that slightly different terms are sometimes used in different parts of the *Guiding Principles*, even when the same or a closely related topic is addressed.

Selected References (Annex IV) lists some of the major international publications related to chemical accident prevention, preparedness and response, along with information on how to obtain the publications. It also includes contact information (including web addresses) for a number of international organisations concerned with the subjects addressed in the *Guiding Principles*.

Background Information (Annex V) briefly describes the process and people involved in the development of the *Guiding Principles* and provides a short overview of the OECD.

A Summary of the "Golden Rules" (Annex VI) sets out the main points of the Golden Rules (*i.e.*, the highlighted text). The complete Golden Rules can be found after the Introduction.

Please note

The OECD *intends to review, and revise, the* Guiding Principles *on a regular basis. Therefore, the* OECD *would appreciate feedback on both the content of this publication and its presentation. If you have any comments or suggestions, please contact the* OECD *Secretariat at:*

OECD *Environment Directorate* (*Environment, Health and Safety Division*)
2, *rue André-Pascal*
75775 *Paris Cedex* 16 *France*
Fax: (33) 1 45 24 16 75
E-*mail*: *ehscont@oecd.org*

INTRODUCTION

About This Publication

These *Guiding Principles* have been prepared as part of the OECD Chemical Accidents Programme and have been produced within the framework of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC). The aim is to set out general guidance for the safe planning and operation of facilities where there are hazardous substances in order to prevent accidents and, recognising that accidents involving hazardous substances may nonetheless occur, to mitigate adverse effects through effective emergency preparedness, land-use planning, and accident response.

The *Guiding Principles* address **all stakeholders**, defined for purposes of this publication as any individual, group or organisation that is involved, interested in, or potentially affected by chemical accident prevention, preparedness and response. Thus, the term stakeholder encompasses everyone with roles, responsibilities and rights related to chemical safety,[2] including industry/management of hazardous installations, employees of such installations, public authorities at all levels, members of the community/public, and other interested parties.[3]

The *Guiding Principles* are designed to be comprehensive, addressing the range of issues related to:

- ***preventing*** *the occurrence of incidents (accidents and near-misses[4]) involving hazardous substances* (e.g., *loss of containment of hazardous substances, explosions, fires,* etc.);
- ***preparing for*** *accidents, and* ***mitigating*** *adverse effects of accidents, through emergency planning, land-use planning,[5] and communication with the public;*
- ***responding*** *to accidents that do occur in order to minimise the adverse consequences to health, the environment and property; and*
- ***follow-up*** *to accidents, including initial clean-up activities, and accident reporting and investigation.*

The *Guiding Principles* relate to the risk of unexpected events involving hazardous substances at any installation, *i.e.*, fixed installations where hazardous substances are produced, processed, used, handled, stored, or disposed of (called "**hazardous installations**" in this publication).

The guidance in this publication also addresses transport of hazardous substances controlled by the management of hazardous installations, and fixed installations involved with the transport of hazardous substances, such as pipelines and transport interfaces (*e.g.*, port areas and railroad marshalling yards).

The *Guiding Principles* do not specifically address the entire subject of transport of dangerous goods *per se* (*e.g.*, by road, rail, ships, planes). However, many of the provisions of this publication are relevant to the prevention of, preparedness for, and response to transport accidents and so could prove very helpful to those involved in transport-related activities.

The *Guiding Principles* are based on the premise that **all hazardous installations should comply with the same overall safety objectives** – that is, the expectation of safety - irrespective of size, location, or whether the installations are privately or publicly owned/operated. Furthermore, this guidance applies not only to installations where chemicals are produced or reformulated, but also to other industries that use or handle potentially hazardous chemicals in their operations, as well as to chemical storage facilities.

The *Guiding Principles* have purposely been drafted to allow **flexibility in their application**, so that users can choose the relevant provisions and adapt them in light of their particular circumstances, including the

local culture, legal context, nature of the risks, and the extent and type of resources available. In this regard, it should be recognised that not all provisions will apply in all circumstances.

This publication is the result of a **collaborative effort** - under the supervision of the OECD Working Group on Chemical Accidents - involving a large number of experts from many countries and organisations, in both the public and private sector. Based on the collective experience of this diverse group of international experts, the *Guiding Principles* seek to establish "best practice".

The publication also tries to achieve a balance between guidance that is general and flexible - so that it can be useful to a wide range of enterprises, agencies and communities - and, at the same time, sufficiently specific and detailed so that it will be a valuable resource to decision-makers.

The *Guiding Principles* take into account, and are consistent with, other international regulatory instruments and guidance materials relevant to chemical accident prevention, preparedness and response. These include instruments and guidance materials prepared in connection with the European Union "Seveso II" Directive,[6] the UN Environment Programme (UNEP) APELL programme,[7] the International Labour Organization conventions and recommendations,[8] the UN Economic Commission for Europe (UNECE) conventions,[9] the World Health Organization (WHO), the International Programme on Chemical Safety (IPCS), and International Maritime Organization (IMO).[10]

This is the **second edition** of the ***Guiding Principles***. The first edition, published in 1992, was widely distributed throughout the world.[11] Thousands of copies were circulated by the OECD, its member countries, and numerous non-governmental organisations (including labour and industry organisations). In addition, other international organisations, including UNEP and the UNECE, distributed copies as part of their activities related to chemical or industrial accidents. The feedback received by the OECD Secretariat reveals that the *Guiding Principles* were found to be very valuable in the development and implementation of laws, regulations, policies and practices.

The second edition of the *Guiding Principles* has been updated to:

- Take account of national and international experience, as well as technical and policy developments, since 1992;
- Incorporate the results of OECD workshops and special reviews on different issues[12] that were held over the past ten years, bringing together a wide range of experts representing various interests and nationalities; and
- Expand the scope to include transport interfaces (*e.g.*, port areas and railroad marshalling yards) and pipelines.

One important difference from the first edition is the inclusion of "Golden Rules", setting out the highlights of the *Guiding Principles*.

Moreover, this version has been reorganised into five major parts:

- Prevention of Chemical Accidents;
- Emergency Preparedness/Mitigation;
- Emergency Response;
- Follow-up to Incidents;
- Special Issues (with two main subsections addressing "Transboundary/International Issues" and "Fixed Installations and Transport").

The order of the provisions within each part has been changed to put the role of industry first, followed by the role of public authorities, so as to reflect the fact that industry has the primary role with respect to the safety of installations.

The second edition also has a revised and updated section on "Explanation of Terms Used" (previously called the Glossary). The Explanation of Terms has been developed for purposes of these *Guiding Principles*

only, and are not agreed-upon definitions for any other purposes. *In order to avoid confusion, it is important for readers to refer to the Explanation of Terms.*

Finally, the format of the second edition has been changed to make the publication more reader-friendly.

Objective

The objective of these *Guiding Principles for Chemical Accident Prevention, Preparedness and Response* is to provide guidance, applicable worldwide, to help stakeholders take appropriate actions to prevent accidents involving hazardous substances and to mitigate the adverse effects of accidents that do nevertheless occur.

Recent experience, including major accidents in countries with extensive legal requirements and administrative frameworks, demonstrates that legislation and regulations, while necessary, are not sufficient to ensure prevention of accidents or adequate preparedness. It is therefore important for all stakeholders to undertake additional initiatives and learn from the experience of others.

Scope

This publication seeks to address the wide range of issues that need to be dealt with in order to ensure effective chemical safety, *i.e.*, the actions that should be taken by industry (including labour), public authorities, communities and other stakeholders to: minimise the likelihood that an accident will occur (***prevention***); to mitigate consequences of accidents through emergency planning, land-use planning and risk communication (***preparedness/mitigation***); and to limit the adverse consequences to health, the environment and property in the event of an accident (***response***). It also includes actions that are needed to learn from the experiences of accidents and other unexpected events (***follow-up***) in order to reduce future incidents (***prevention***).

It is often difficult to clearly delineate which issues and actions fall within each of these stages, and there is significant overlap among them. Therefore, the entire process is sometimes described as a "Safety Continuum" or "Emergency Management Cycle" (see below). The *Guiding Principles* address these stages, and the roles and responsibilities of the different stakeholders in each stage.

Safety Continuum

Prevention

avoiding incidents and lessening impacts, and learning from experience to reduce vulnerability and increase resilience



Preparedness

being alert, ready and trained to act prior to the onset of an accident

Response

managing the consequences of an accident and providing immediate relief, as well as taking steps towards restoring and returning to normality

Parties addressed

This publication contains guidance for the range of individuals, groups or organisations who are involved or interested in, or potentially affected by, chemical accident prevention, preparedness or response (collectively known as "stakeholders" in this publication).

Industry

Since the primary responsibility for the safety of hazardous installations rests with those who own and operate such installations, the largest part of this publication is devoted to identifying the roles and responsibilities of industry.

Industry is defined to include owners/shareholders/operators of relevant enterprises (whether private or public entities), management, other employees, and contractors working with the installation. In this publication, the word "management" should be read to include anyone with decision-making responsibility for the enterprise, including owners and managers; the word "employee" is defined as any individual(s) working at, or on behalf of, a hazardous installation, including both management and labour, as well as (sub)contractors; and "labour" includes any individual(s) working at, or on behalf of, a hazardous installation who is not part of management.

For purposes of this publication, government agencies that operate hazardous installations (*e.g.*, waste water treatment facilities, transport interfaces, or warehouses of chemicals) should be considered "industry".

Public authorities

The *Guiding Principles* recognise the importance of public authorities in all the stages of the safety continuum. Hence, this publication includes guidance related to the roles and responsibilities of public authorities at all levels who are involved with the many disciplines inherent in chemical accident prevention, preparedness and response (*e.g.*, environment, public health, occupational health and safety, civil defence, industrial development, international relations). This guidance is relevant to regulatory/enforcement authorities (at the national, regional and local levels), emergency response personnel, public health authorities, medical providers and other types of government agencies.

Communities/public

The *Guiding Principles* also address the role of the public, both in general and more specifically the members of the local community near a hazardous installation and those potentially affected in the event of an accident. The focus is on provision of, and access to, information concerning the hazardous installation and emergency preparedness and response, as well as on public participation in decision-making related to hazardous installations. An underlying premise is that there should be two-way channels of information and communication so that the members of the community/public not only receive information but also have opportunities to inform and influence industry, public authorities and other stakeholders. It is recognised that the way the public is informed, and can participate in decision-making, will differ between countries and communities, but there are underlying principles that should be common across boundaries.

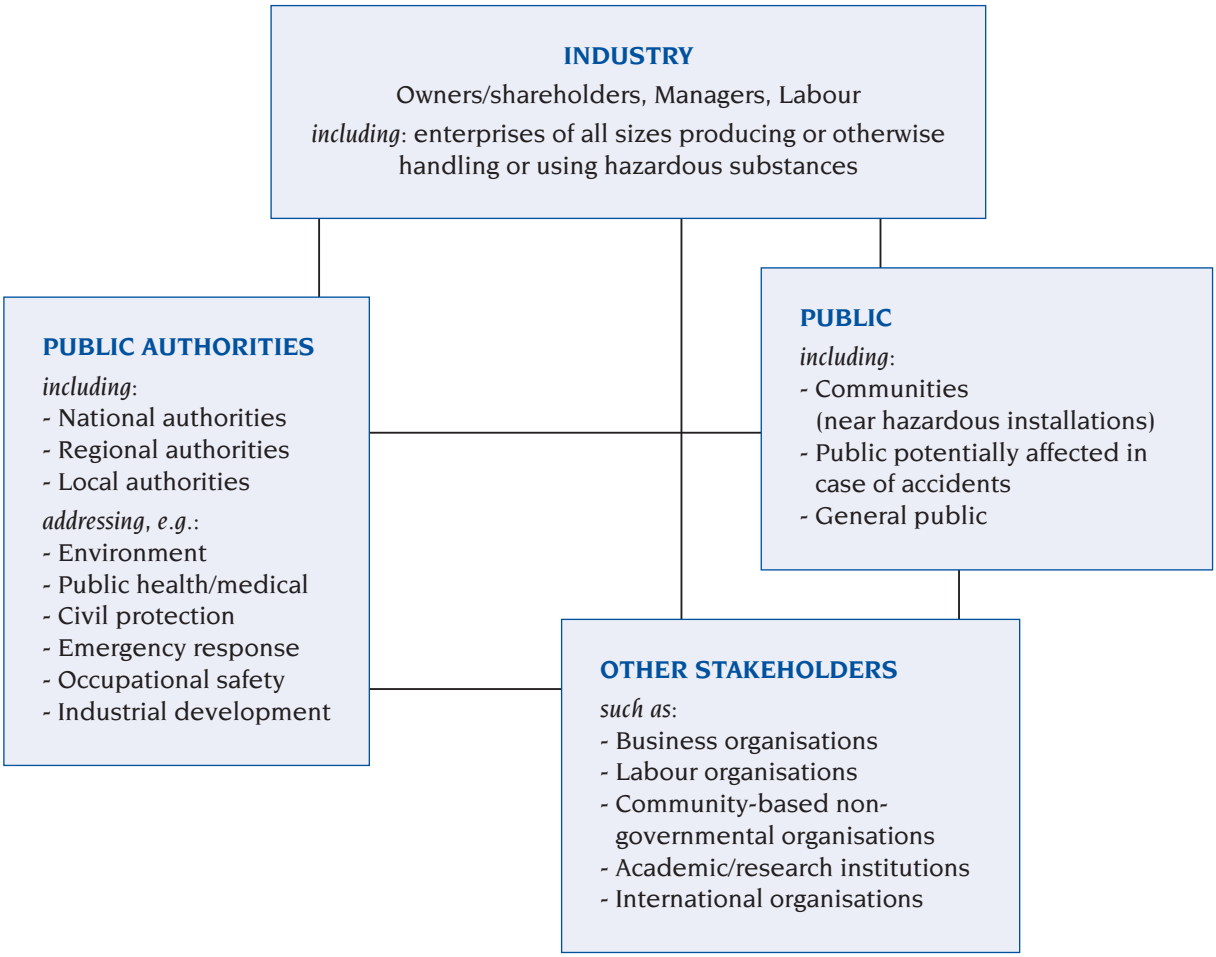
Other stakeholders

There are also provisions in this publication related to other stakeholders, such as labour organisations, other non-governmental organisations, research/academic institutions and intergovernmental organisations.

Co-operation and communication

A key point repeated throughout the *Guiding Principles* is the importance of co-operation and co-ordination among and between stakeholders, including co-operation among stakeholders within the community where hazardous installations are located (*i.e.*, at the local level). For example, to ensure that all stakeholders have the information they need to carry out their responsibilities, there must be effective communication between public authorities and industry, between public authorities and the public, between management and labour, between different enterprises with common interests (either because

Stakeholders Addressed in the Guiding Principles



of location or similarity of concerns), and between industry and the public. Co-operation not only strengthens each stakeholder's abilities, but also helps to build and maintain trust and avoid confusion, overlaps, conflicts and gaps.

Installations covered

The *Guiding Principles* apply to all types of hazardous installations - irrespective of size, location or whether they are owned/operated by a private or public entity - that pose the risk of an accident involving hazardous substances with impacts on health, the environment, or property. Thus, these *Principles* apply to any fixed installation/facility where hazardous substances[13] are produced, processed, used, handled, stored, transported, or disposed of, with the potential for fire, toxic emission, explosion, spill, or other type of accident involving hazardous substances. This includes, for example:

- chemical manufacturers and formulators;
- companies that use hazardous substances in the manufacture or processing of other products;
- storage facilities that contain hazardous substances; and
- transport interfaces[14], where hazardous substances are loaded or unloaded, or where they are transferred from one vehicle to another (*e.g.*, train, truck, ship), and pipelines.

Thus, the determining factor for whether this guidance is applicable is the possibility that an accident involving hazardous substances could occur with impacts on health, the environment, or property, not the size or location of the facility. In this regard, small and medium-sized enterprises,[15] and enterprises that are not part of the chemical industry, need to be aware of their responsibilities in ensuring chemical safety; nonetheless, it should be recognised that such enterprises are less likely to have access to specialist staff, information and resources in this area.

This guidance does not generally address transport of hazardous substances;[16] however, it does address certain aspects of transport involving fixed installations including:

- transport within the control of hazardous installations (*e.g.*, on-site transport of hazardous substances and decisions concerning how hazardous substances will be transported to and from the installation); and
- transport interfaces including, for example, railroad marshalling yards and port areas; and
- pipelines.

Even though accidents involving the transport of hazardous substances by road, rail, or waterways are not specifically addressed in this publication, many of the provisions of the Guiding Principles *are relevant for these situations, especially with respect to preparedness for, and response to, transport accidents.*

Issues addressed

The aim of the *Guiding Principles* is to address the wide range of issues associated with chemical accident prevention, preparedness, and response, including reporting and follow-up activities (but not including long-term clean-up and restoration following an accident). For purposes of this publication, a chemical accident is defined as *any unplanned event involving hazardous substances that causes or is liable to cause harm to health, the environment or property*, such as loss of containment of hazardous substances, explosions, and fires. These events are generally the result of unintended technological failures and/or human errors (or a combination of these). This document also applies to chemical accidents that occur as a result of natural disasters, or certain sudden releases due to *deliberate action*, *e.g.*, from sabotage, terrorism, vandalism or theft.[17]

Accidents involving the release of radioactive materials have not been addressed in this publication, as this subject is already covered in other international guidance materials. Nor do these *Guiding Principles* address the release of biological matter. However, the *Guiding Principles* do address accidents involving chemicals that have been produced at nuclear facilities, and chemicals produced by biological processes. Furthermore, many of the principles described in this publication also apply in the context of nuclear and biotechnology installations.[18]

The *Guiding Principles* also do not deal with long-term events, such as chronic pollution from hazardous substances. However, the issues addressed herein are closely related to other aspects of environmental protection, occupational and public health, and sustainable development. It is therefore beneficial for enterprises to integrate and co-ordinate their programmes and policies concerning various aspects of safety, health and environment.

Worldwide application

These *Guiding Principles* have been designed to be applicable and useful *worldwide*, not just in OECD countries. This is why the guidance is designed to be consistent with, and complementary to, other international guidance materials, and why a large number of public and private organisations were consulted in the development and review process.

As with the first edition, it is expected that the *Guiding Principles* will be distributed throughout the world, through the OECD and its member countries, interested non-governmental organisations and various UN

and other international organisations. All interested parties are encouraged to share the *Guiding Principles* within their countries/organisations and to adapt the text to their specific needs and circumstances.

GUIDANCE ON SAFETY PERFORMANCE INDICATORS

A companion document, entitled *Guidance on Safety Performance Indicators* (2003), will be published immediately following the 2nd edition of the Guiding Principles. The Guidance on SPI is designed to assist relevant stakeholders to establish programmes for assessing their own performance related to the prevention of, preparedness for, and response to chemical accidents. This should help to improve the ability of interested industrial enterprises, public authorities and community organisations to measure whether the many steps that are taken to reduce the likelihood of accidents, and improve preparedness and response capabilities, truly lead to safer communities and less risk to human health and the environment.

The Guidance on SPI does not define a precise methodology; rather it provides suggestions of how to develop SPI programmes, along with lists of the elements that could be used in such programmes, based on the collective experience of experts in this field.

The guidance is designed to be flexible, so that it can be a tool for the voluntary use of concerned stakeholders worldwide. It is intended to complement other related activities, including industry initiatives.

"GOLDEN RULES"

The "Golden Rules" are a new addition to the 2nd edition of the Guiding Principles. The objective is to highlight in several pages the primary roles and responsibilities of the major stakeholders with respect to chemical accident prevention, preparedness and response. It should be recognised that these points represent best practice, i.e., objectives to be achieved over time. They are not one-time actions but rather require ongoing vigilance. This section briefly explains each of the Golden Rules. A summary of the Golden Rules is available in Annex VI.

The Golden Rules are not meant to be a complete overview of the Guiding Principles; they do not address the full range of issues discussed in this publication. In order to fully understand the points made in these Rules, it is important to refer to the entire text of the Guiding Principles.

ROLE OF ALL STAKEHOLDERS

- **Make chemical risk reduction and accident prevention, as well as effective emergency preparedness and response, priorities in order to protect health, the environment and property.**
  While the risks of accidents are in the communities where hazardous installations are located, requiring efforts by stakeholders[19] at the local level, there are also responsibilities for stakeholders at regional, national and international levels.

- **Communicate and co-operate with other stakeholders on all aspects of accident prevention, preparedness and response.**
  Communication and co-operation should be based on a policy of openness, as well as the shared objective of reducing the likelihood of accidents and mitigating the adverse affects of any accidents that occur. One important aspect is that the potentially affected public should receive information needed to support prevention and preparedness objectives, and should have the opportunity to participate in decision-making related to hazardous installations, as appropriate.

ROLE OF INDUSTRY (including management and labour)

Management

- **Know the hazards and risks at installations where there are hazardous substances.**
  All enterprises that produce, use, store, or otherwise handle hazardous substances should undertake, in co-operation with other stakeholders, the hazard identification and risk assessment(s) needed for a complete understanding of the risks to employees, the public, the environment and property in the event of an accident. Hazard identification and risk assessments should be undertaken from the earliest stages of design and construction, throughout operation and maintenance, and should address the possibilities of human or technological failures, as well as releases resulting from natural disasters or deliberate acts (such as terrorism, sabotage, vandalism, or theft). Such assessments should be repeated periodically and whenever there are significant modifications to the installation.

- **Promote a "safety culture" that is known and accepted throughout the enterprise.**
  The safety culture, reflected in an enterprise's Safety Policy, consists of both an attitude that safety is a priority (*e.g.*, accidents are preventable) and an appropriate infrastructure (*e.g.*, policies and procedures).

To be effective, a safety culture requires visible top-level commitment to safety in the enterprise, and the support and participation of all employees[20] and their representatives.

- **Establish safety management systems and monitor/review their implementation.**
  Safety management systems for hazardous installations include using appropriate technology and processes, as well as establishing an effective organisational structure (*e.g.*, operational procedures and practices, effective education and training programmes, appropriate levels of well-trained staff, and allocation of necessary resources). These all contribute to the reduction of hazards and risks. In order to ensure the adequacy of safety management systems, it is critical to have appropriate and effective review schemes to monitor the systems (including policies, procedures and practices).

- **Utilise "inherently safer technology" principles in designing and operating hazardous installations.**
  This should help reduce the likelihood of accidents and minimise the consequences of accidents that occur. For example, installations should take into account the following, to the extent that they would reduce risks: minimising to the extent practicable the quantity of hazardous substances used; replacing hazardous substances with less hazardous ones; reducing operating pressures and/or temperatures; improving inventory control; and using simpler processes. This could be complemented by the use of back-up systems.

- **Be especially diligent in managing change.**
  Any significant changes (including changes in process technology, staffing, and procedures), as well as maintenance/repairs, start-up and shut-down operations, increase the risk of an accident. It is therefore particularly important to be aware of this and to take appropriate safety measures when significant changes are planned - before they are implemented.

- **Prepare for any accidents that might occur.**
  It is important to recognise that it is not possible to totally eliminate the risk of an accident. Therefore, it is critical to have appropriate preparedness planning in order to minimise the likelihood and extent of any adverse effects on health, the environment or property. This includes both on-site preparedness planning and contributing to off-site planning (including provision of information to the potentially affected public).

- **Assist others to carry out their respective roles and responsibilities.**
  To this end, management should co-operate with all employees and their representatives, public authorities, local communities and other members of the public. In addition, management should strive to assist other enterprises (including suppliers and customers) to meet appropriate safety standards. For example, producers of hazardous substances should implement an effective Product Stewardship programme.

- **Seek continuous improvement.**
  Although it is not possible to eliminate all risks of accidents at hazardous installations, the goal should be to find improvements in technology, management systems, and staff skills in order to move closer toward the ultimate objective of zero accidents. In this regard, management should seek to learn from past experiences with accidents and near-misses, both within their own enterprises and at other enterprises.

Labour

- **Act in accordance with the enterprise's safety culture, safety procedures, and training.**
  In the discharge of their responsibilities, labour should comply with all the procedures and practices relating to accident prevention, preparedness and response, in accordance with the training and instructions given by their employer. All employees (including contractors) should report to their supervisor any situation that they believe could present a significant risk.

- **Make every effort to be informed, and to provide information and feedback to management.**
  It is important for all employees, including contractors, to understand the risks in the enterprise where they work, and to understand how to avoid creating or increasing the levels of risk. Labour should, to the extent possible, provide feedback to management concerning safety-related matters. In this regard, labour and their representatives should work together with management in the development and implementation of safety management systems, including procedures for ensuring adequate education and training/retraining of employees. Labour and their representatives should also have the opportunity to participate in monitoring and investigations by the employer, or by the competent authority, in connection with measures aimed at preventing, preparing for, and responding to chemical accidents.

- **Be proactive in helping to inform and educate your community.**
  Fully informed and involved employees at a hazardous installation can act as important safety ambassadors within their community.

ROLE OF PUBLIC AUTHORITIES

- **Seek to develop, enforce and continuously improve policies, regulations, and practices.**
  It is important for public authorities[21] to establish policies, regulations and practices, and have mechanisms in place to ensure their enforcement. Public authorities should also regularly review and update, as appropriate, policies, regulations, and practices. In this regard, public authorities should keep informed of, and take into account, relevant developments. These include changes in technology, business practices, and levels of risks in their communities, as well as experience in implementing existing laws and accident case histories. Public authorities should involve other stakeholders in the review and updating process.

- **Provide leadership to motivate all stakeholders to fulfil their roles and responsibilities.**
  Within their own sphere of responsibility and influence, all relevant public authorities should seek to motivate other stakeholders to recognise the importance of accident prevention, preparedness and response, and to take the appropriate steps to minimise the risks of accidents and to mitigate the effects of any accidents that occur. In this regard, the authorities should establish and enforce appropriate regulatory regimes, promote voluntary initiatives, and establish mechanisms to facilitate education and information exchange.

- **Monitor the industry to help ensure that risks are properly addressed.**
  Public authorities should establish mechanisms for monitoring hazardous installations to help ensure that all relevant laws and regulations are being followed, and that the elements of a safety management system are in place and are functioning properly, taking into account the nature of the risks at the installations (including the possibilities of deliberate releases). Public authorities can also take these opportunities to share experience with relevant employees of the installations.

- **Help ensure that there is effective communication and co-operation among stakeholders.**
  Information is a critical component of safety programmes. Public authorities have an important role in ensuring that appropriate information is provided to, and received by, all relevant stakeholders. Public authorities have a special role in facilitating education of the public concerning chemical risks in their community so that members of the public are reassured that safety measures are in place, that they understand what to do in the event of an accident, and that they can effectively participate in relevant decision-making processes. Public authorities are also in a position to facilitate the sharing of experience (within and across borders).

- **Promote inter-agency co-ordination.**
  Chemical accident prevention, preparedness and response is, by nature, an inter-disciplinary activity involving authorities in different sectors and at different levels. To help ensure effective prevention,

preparedness and response, and efficient use of resources, it is important that all relevant agencies co-ordinate their activities.

- **Know the risks within your sphere of responsibility, and plan appropriately.**
  Public authorities are responsible for off-site emergency planning, taking into account the relevant on-site plans. This should be done in co-ordination with other stakeholders. In addition, public authorities should ensure that the resources necessary for response (*e.g.*, expertise, information, equipment, medical facilities, finances) are available.

- **Mitigate the effects of accidents through appropriate response measures.**
  Public authorities (often at the local level) have primary responsibility for ensuring response to accidents that have off-site consequences, to help reduce deaths and injuries, and to protect the environment and property.

- **Establish appropriate and coherent land-use planning policies and arrangements.**
  Land-use planning (*i.e.*, establishing and implementing both general zoning as well as specific siting of hazardous installations and other developments) can help to ensure that installations are appropriately located, with respect to protection of health, environment and property, in the event of an accident. Land-use planning policies and arrangements can also prevent the inappropriate placing of new developments near hazardous installations (*e.g.*, to avoid the construction of new residential, commercial or public buildings within certain distances of hazardous installations). Land-use planning policies and arrangements should also control inappropriate changes to existing installations (*e.g.*, new facilities or processes within the installation). They should also allow for the possibility of requiring changes to existing installations and buildings to meet current safety standards.

ROLE OF OTHER STAKEHOLDERS (*e.g.*, communities/public)

- **Be aware of the risks in your community and know what to do in the event of an accident.**
  Members of communities near hazardous installations, and others that might be affected in the event of an accident, should make sure that they understand the risks they face and what to do in the event of an accident to mitigate possible adverse effects on health, the environment and property (*e.g.*, understand the warning signals, and what actions are appropriate). This involves reading and maintaining any information they receive, sharing this information with others in their household, and seeking additional information as appropriate.

- **Participate in decision-making relating to hazardous installations.**
  The laws in many communities provide opportunities for members of the public to participate in decision-making related to hazardous installations, for example by commenting on proposed regulations or zoning decisions, or providing input for procedures concerning licensing or siting of specific installations. Members of the public should take advantage of these opportunities to present the perspective of the community. They should work towards ensuring that such opportunities exist, whenever appropriate, and that the public has the information necessary for effective participation.

- **Co-operate with local authorities, and industry, in emergency planning and response.**
  Representatives of the community should take advantage of opportunities to provide input into the emergency planning process, both with respect to on-site and off-site plans. In addition, members of the public should co-operate with any tests or exercises of emergency plans, following directions and providing feedback, as appropriate.

NOTES

1. The EHS Division produces publications in eight series (*Testing and Assessment*; *Good Laboratory Practice and Compliance Monitoring*; *Pesticides*; *Risk Management*; *Harmonisation of Regulatory Oversight in Biotechnology*; *Chemical Accidents*; *Pollutant Release and Transfer Registers*; and *Safety of Novel Foods and Feeds*). More information about the EHS Programme and EHS publications is available on the OECD's web page (www.oecd.org/ehs/).

2. The term "safety" is used in this publication to include protection of health, the environment and property to the extent that this relates to prevention of, preparedness for, or response to accidents involving hazardous substances.

3. See "Objectives/Scope" for further elaboration of the parties addressed.

4. See Annex I for an explanation of the terms "accident" and "near-miss", as used in this publication. "Accidents" are defined to include unexpected events that could be triggered by, for example, technological or human error, deliberate acts (such as sabotage, terrorism, vandalism or theft) or natural disasters. Accidents can cause direct or indirect harm to the environment, health and/or property as the result of fire, explosion or the release of hazardous substances. They can also create indirect harm to health through, for example, contamination of water or food.

5. It is recognised that land-use planning can be viewed as a preventative measure (*e.g.*, by helping to ensure that hazardous installations and other developments are separated by appropriate distances, thereby preventing adverse effects) or it can be viewed as a means to mitigate adverse effects of accidents.

6. Council Directive 96/82/EC of 9 December 1996 on the control of major accident hazards involving dangerous substances. (Note: a proposal to modify this Directive is under consideration).

7. APELL stands for "Awareness and Preparedness for Emergencies at Local Level". See text box at the end of chapter 5 for further information.

8. Convention concerning the Prevention of Major Industrial Accidents (No. 174) and accompanying Recommendation (No. 181), adopted in 1993, and the Convention concerning Safety in the Use of Chemicals at Work (No.170) and its accompanying Recommendation (No. 177), adopted in 1990.

9. Convention on the Transboundary Effects of Industrial Accidents and Convention on the Protection and Use of Transboundary Watercourses and International Lakes.

10. Many of these materials are listed in Annex IV; some provide further information/guidance on subjects addressed herein.

11. The first edition of the *Guiding Principles* was available in a number of languages. Information about translations of the first and second edition is available on the OECD website: www.oecd.org/ehs/

12. A list of these workshops is included in Annex IV. Copies of the reports of these workshops are available at: www.oecd.org/ehs/

13. Hazardous substance is defined for purposes of this publication in Annex I ("Explanation of Terms Used"). The term hazardous substance overlaps with similar terms used in other international texts, such as dangerous goods, dangerous cargoes or hazardous chemicals.

14. Transport interfaces include, for example, port areas and railroad marshalling yards.

15. See SME textbox at the end of Chapter 1.

16. In the context of transportation, the terms "dangerous goods" or "dangerous cargoes" are often used to describe the materials being transported. For purposes of this document, the term "hazardous substances" will be used, but is meant to be generally equivalent to the terms dangerous goods or dangerous cargo as used in international agreements (such as those developed by the UN Committee of Experts on the Transport of Dangerous Goods, the IMO, or the UNECE) but would not include radioactive materials.

17. This document does not address issues specific to deliberate acts, although most of the guidance is relevant to such situations. These issues will be further addressed in the future.

18. Certain aspects of G*uiding* P*rinciples* do not apply to military facilities to the extent that this might compromise national security.

19. For purposes of this publication, stakeholders are defined as any individual, group or organisation that is involved, interested in, or potentially affected by chemical accident prevention, preparedness or response. Relevant stakeholders include owners and managers of hazardous installations, other employees at the installations and their representatives, public authorities at all levels, and the public/communities.

20. For purposes of this publication, "employee" is defined as any individual(s) working at, or on behalf of, a hazardous installation. This includes both management and labour, as well as (sub)contractors.

21. For purposes of this publication, public authorities are defined to include national, regional and local authorities responsible for any aspect of chemical accident prevention, preparedness and response. This would include, *inter alia*, agencies involved in environmental protection, public health, occupational safety, industry and emergency response/civil protection.

Part A

PREVENTION OF CHEMICAL ACCIDENTS

This Part is by far the longest of the Guiding Principles, reflecting the importance of prevention of chemical accidents. Chapter 1 (General Principles) includes an overview of the roles and responsibilities of the various interested stakeholders, recognising that prevention is the concern of a wide range of different parties. It also emphasises the need for co-operation among stakeholders, and it takes into account the fact that risks need to be addressed at the local level. These points are further elaborated in Chapters 2 – 4, which give more specific information on the roles and responsibilities of industry, public authorities, and the public and other stakeholders, respectively.

Chapter 1

GENERAL PRINCIPLES

1.1. The primary objective of safety-related programmes at hazardous installations is the prevention of accidents that result in harm to health, the environment or property (recognising that accidents involving hazardous substances may, nonetheless, occur).

1.2. The prevention of accidents involving hazardous substances is the concern of all stakeholders including: industry (*e.g.*, owners and managers of hazardous installations, other employees and (sub) contractors working at or on behalf of such installations, and employee representatives[1]); public authorities at national, regional and local levels; and communities.

- For accident prevention activities to be effective, co-operative efforts should be undertaken among relevant parties, at all levels. Within communities where there are hazardous installations, it is important for industry, local authorities and the public to work together to reduce risks of accidents.

- This co-operation should be based on a policy of openness which will, among other things, help increase public confidence that appropriate measures are being taken to limit the risk that accidents involving hazardous substances will have off-site effects.

1.3. All hazardous installations should comply with the same overall safety objectives (*i.e.*, the same expectation of safety) irrespective of size, location or other factors. Industry's obligation to operate safely applies to enterprises of all sizes that produce, use, handle, transport, store or dispose of hazardous substances, including those enterprises that are not chemical producers or otherwise not considered part of the chemical industry.

1.4. Safety should be an integral part of the business activities of an enterprise, and all hazardous installations should strive to reach the ultimate goal of zero incidents[2]. Resources should be targeted towards this goal.

- Establishing an ultimate goal of zero incidents provides the incentive to achieve the best possible performance and ensures continuous efforts towards greater safety.

- Progress towards this goal can be furthered by establishing, communicating and publishing safety-related objectives, and measuring progress towards the objectives.

1.5. M*anagement* of hazardous installations has the primary responsibility for operating installations safely and for developing the means to do so.

1.6. I*ndustry* should periodically monitor and/review safety performance in hazardous installations in order to:

- assess achievements with respect to the general goals set;
- determine how well specific safety-related policies and decisions have been put into practice;
- focus resources where improvements are most needed;

- provide information to justify the adjustment or 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;
- provide information on safety achievements to the public authorities, community, shareholders and non-governmental organisations (NGOs); and
- provide input into education and training activities.

1.7 When activities are contracted to third parties, management should ensure that the relevant contracts incorporate provisions on roles and responsibilities related to safety, and should allocate sufficient resources for the third parties to take on these roles and responsibilities.

- Procedures should be in place to establish the suitability of third party contractors to carry out their roles in a safe manner.

- In any event, management retains the responsibility for the safety of installations.

1.8 *Management* should co-operate with public authorities to assist the authorities in meeting their responsibilities.

1.9 *Management* should encourage, and facilitate, the reporting by all employees (including (sub)contractors) of any chemical accident and near-miss, in order to learn from experience. This is critical to ensuring continuous improvements in safety over time.

1.10 *Producers* of hazardous substances have a responsibility to promote the safe management of such substances throughout their total life cycle, and provide assistance to downstream users, consistent with the principle of Product Stewardship.

1.11 All *employees*[3] should share responsibility for, and have a role to play in, the prevention of accidents by carrying out their jobs with an active regard for safety, by supporting the ability of others to do so, and by contributing to the development and implementation of safety policies and practices.

1.12 *Public authorities* should set general safety objectives, establish a clear and coherent control framework and ensure, through appropriate inspection and enforcement measures, that all relevant requirements are being met.

- They should be proactive in stimulating the development of new approaches for accident prevention, in addition to their more traditional reactive role responding to specific public concerns.

- They should take a leadership role in motivating all sectors of society to recognise the need for accident prevention, in identifying the tools needed, and in developing a national culture that promotes accident prevention.

- They should ensure that the public receives information concerning hazardous installations and help the public understand this information, so as to build public confidence in regulatory regimes.

1.13 *Public authorities* should co-operate with, and stimulate, industry (management and other employees) to carry out industry's responsibility to ensure the safe operation of hazardous installations, and to provide information to the public concerning potential risks and safety measures. Furthermore, public authorities should promote assistance for the improvement of safety programmes in small or medium-sized enterprises (SMEs) and other enterprises that may have limited personnel and resources.

- 1.14 *Public authorities* should periodically inspect safety performance in hazardous installations, to support their enforcement programme. Inspection programmes also provide a means for public authorities to share information about safety with management of such installations, and help authorities to establish priorities for their work.

- 1.15 *Local authorities* should make an effort to establish co-operative arrangements with enterprises in their community, with the aim of improving overall chemical safety and, in particular, assisting SMEs and other enterprises with limited resources to prevent, and prepare for, accidents involving hazardous substances.

- 1.16 *Multi-stakeholder groups* should be established at regional and national levels as a means for developing and disseminating information on safety as well as for developing consensus-based approaches that are easily accepted by all parties.

- 1.17 *Public authorities, industry associations and others* should improve the sharing of information and guidance materials related to prevention of chemical accidents and, more generally, to improving the health, safety and environmental performance of hazardous installations. This information should address both technical matters as well as issues relating to human factors and safety management systems.

- 1.18 *All stakeholders* should be involved in addressing the fundamental issue related to risk acceptability/tolerability in a community.

  - In this regard, each country/organisation should decide on its own criteria for acceptability/tolerability. Reaching a consensus on what is acceptable/tolerable can be helped by having an agreed framework for judging the criteria.

  - While risk assessment informs the decision-making process, it should not be the sole decisive influence. Such questions are a matter of socio-political judgement.

- 1.19 Means should be made available to assist *enterprises with limited resources* that need support or assistance to improve their safety programmes (such as some SMEs).

  - A multi-faceted approach, with a variety of entities and programmes, may be necessary in order to address possible concerns and limitations of SMEs and other enterprises that might need support or assistance.

  - For example, such enterprises should consider:
    - entering into co-operative arrangements with public authorities, industry/trade associations, and/or other enterprises to work towards safety improvements in their communities and obtain the information and training needed to improve safety;
    - entering into partnerships with other enterprises to form "mutual aid" response groups so that limited resources can be pooled and shared should chemical accidents occur (relevant SMEs should seek the assistance of public authorities in establishing such mutual aid groups);
    - entering into mutually beneficial relationships with suppliers and customers and welcome offers of assistance and audits from them; and
    - joining professional organisations.

  - Various stakeholders (individual enterprises, industry/trade associations, industry-government partnerships, public authorities, safety commissions, professional organisations, labour unions/confederations, research/education facilities, media) should provide assistance, information, technical tools and incentives to enterprises that might need assistance. For example, larger enterprises should make their expertise available to assist smaller enterprises in their

community with respect to chemical safety. Enterprises should also make an effort to provide assistance to customers, suppliers and other enterprises in related industries.

SMALL and MEDIUM-SIZED ENTERPRISES

All hazardous installations should comply with the same overall safety objectives (*i.e.*, the same expectation of safety) irrespective of size, location or other factors.

SMEs generally share a number of characteristics that raise concerns about the risks of accidents. For example: they generally have a less formal operating structure than larger enterprises; they tend to employ few engineers and safety specialists; and they tend to rely on business partners and other outside sources for information related to chemical safety.

On the other hand, SMEs have many strengths that can be used to enhance chemical safety management. For example, they may be in a position to implement procedural changes more quickly than larger companies, and they are more likely to have open communication channels.

SMEs are being addressed in the *Guiding Principles* because: (i) special efforts may be necessary to ensure that such enterprises are aware of the need to deal with chemical safety issues; and (ii) they may need additional assistance in implementing the actions suggested by the *Guiding Principles*.

A multifaceted approach is needed in which a variety of entities and programmes address the various concerns and limitations of SMEs (*see, e.g., paras.* 1.19 *and* 2*i*.5 – 6).

- SMEs should undertake to:
  - recognise the importance of safety as an integral part of their business operation and commit themselves to safe operations;
  - actively seek information on safety;
  - enter into partnerships with public authorities and/or other enterprises with the objective of improving safety;
  - create "mutual aid" response groups with other enterprises; and
  - join professional organisations.

- Other stakeholders should make an effort to assist SMEs to reduce risks of accidents, as may be needed, through provision of information, guidance and assistance. Such stakeholders include:
  - other enterprises, including suppliers and peer groups;
  - public authorities, including local authorities;
  - trade/industry associations, including associations of businesses that use (but do not produce) hazardous substances; and
  - multi-stakeholder groups, industry self-help organisations, industry-government partnerships, safety commissions, professional organisations, labour unions, consultants, educational facilities, non-governmental organisations, and the media.

Public authorities as well as industry and trade associations should, as appropriate, provide guidance on how regulations can be met by SMEs.

The OECD has prepared a short brochure, directed specifically at managers of SMEs, to introduce the concepts included in the *Guiding Principles*. Copies of this brochure can be obtained by contacting OECD, or can be found at: www.oecd.org/ehs/, (click on "Chemical Accidents", then "About Chemical Accidents", then in the box labeled "More" click on Small and Medium-sized Enterprises (SMEs). The website contains other information of interest to SMEs.

Chapter 2

INDUSTRY (including management and labour)

This Chapter (related to the role of Industry) recognises that enterprises have primary responsibility for accident prevention, and that chemical safety should be an integral part of all phases of an enterprise from design and construction, through operation and maintenance, to decommissioning/closure/demolition. In addition to addressing the role of management, it also includes provisions relating to the role of labour (defined to be all employees other than management working at or on behalf of a hazardous installation including (sub)contractors).

a. SAFETY CULTURE

General principles

- 2.a.1 Each enterprise should establish and promote a corporate safety culture, reflected in a corporate Safety Policy.

  - An effective safety culture is an essential element of safety management.

  - The safety culture should derive from the values, attitudes and behaviour of senior management and the communication of these throughout the organisation. The safety culture starts with the visible commitment of the Board members and senior executives of the enterprise, who should set an example and demonstrate leadership by being actively involved in safety issues.

  - In addition to this top-down commitment to safety as a priority, there should be a bottom-up commitment through the active application of safety policies by all employees. Inherent in the safety culture, all employees should be dedicated to doing their jobs in a safe manner, following established procedures, and assisting their colleagues in meeting these challenges.

  - The safety culture should incorporate, as an essential element, the belief that all accidents are preventable.

  - As part of its safety culture, the enterprise should establish comprehensive rules concerning the roles, rights and obligations of all those concerned with the assurance and maintenance of safety.

  - For effective accident prevention, safety considerations should be incorporated into, among other things: planning, design, construction and commissioning of installations; operating policies and procedures, including organisation and personnel arrangements; maintenance; temporary shutdowns; monitoring and assessment of safety; and decommissioning, closure and demolition of hazardous installations.

- 2.a.2 As part of the safety culture, there should be a clearly-stated and visible commitment to safety in an enterprise, directed at having all employees act appropriately with regard to safety. This commitment is evidenced by practices such as:

- clear and visible management interest in safety performance through personal involvement in safety matters;
- good communication on safety issues among and between management and other employees;
- positive feedback concerning actions taken to increase safety;
- quick response to remedy identified faults;
- financial and career incentives for good safety performance;
- participation of employees at all levels in developing and reviewing safety management procedures; and
- timely investigations of all accidents and relevant near-misses, and rapid dissemination of the findings of the investigations.

■ 2.a.3 The safety culture should encourage initiative and alertness in the interest of safety.

▸▸ The safety culture should help guard against complacency or structural/procedural shortcomings, all of which leads to unsafe acts or practices.

▸▸ One important characteristic of an effective safety culture is "error tolerance"; such a safety culture should develop the capacity of employees to effectively perform their duties and not be focused on assessing blame or punishing errors. The safety culture should encourage an atmosphere of co-operation and openness in which employees feel comfortable about discussing errors and near-misses in order to improve learning. An error-tolerant culture nevertheless requires appropriate responsibility and accountability.

▸▸ To promote such a safety culture, employees and their representatives should be provided with opportunities to participate in the development and review of procedures and should be empowered to take action consistent with safe operation and/or protection of life without fear of reprisals.

■ 2.a.4 Management should take all appropriate actions to ensure that all employees are aware of their roles and responsibilities with respect to safety, and have the necessary skills, training, education, support and resources to assume these roles and responsibilities. Management should ensure that all safety procedures are disseminated, well-known and understood by all employees (and others, as appropriate).

(See Section 2.d below on "Operation," which includes provisions related to "Personnel" and "Education and training")

■ 2.a.5 Management and other employees should not become complacent if there have not been any accidents at an installation over a period of time; continuous efforts are needed to maintain safety.

■ 2.a.6 The safety culture of an enterprise can be enhanced if management has an open attitude towards the public with respect to safety issues.

Safety policy

■ 2.a.7 Each enterprise should have a clear and meaningful written statement of its Safety Policy agreed, promulgated and applied throughout the enterprise, reflecting the corporate safety culture, containing the overall aims and principles with respect to chemical safety, and incorporating the "zero incident" goal as well as the safety objectives established by public authorities.

▸▸ The Safety Policy should be at the top of a hierarchy of documentation related to chemical safety at an enterprise, with each subsequent level explaining in more detail the application of the Policy, and including working documents and instructions.

- The Policy should address accident prevention, preparedness and response, including the elements of the safety management system (*see "Safety management systems", below*).

- The Safety Policy should set out to protect the safety and health of all persons involved in, or who may be affected by, the production, process, handling, use, storage, disposal or elimination of hazardous substances, as well as to safeguard the environment and property.

- The Safety Policy should be reviewed regularly and amended, as appropriate, in light of experience gained and any relevant changes in technologies, laws and regulations.

2.a.8 In developing, reviewing and amending the Safety Policy, management should consult with, and involve, employees at all levels. Employees responsible for the development of corporate safety policies should be independent from those responsible for production management and should have direct access to top management.

2.a.9 The Safety Policy should be widely communicated throughout the enterprise. Management should strive to ensure that the intent of the Safety Policy is understood and appreciated by all employees throughout the enterprise.

2.a.10 Management and other employees should co-operate to comply with the enterprise's Safety Policy and meet its safety goals.

- Management and labour have different but complementary roles and responsibilities in the prevention of accidents by carrying out their jobs in a safe manner, by contributing actively to the development and implementation of safety policies and practices, and by co-operating with each other and with other stakeholders.

- Employees at all levels should be motivated and educated/trained to recognise safety as a top priority and its continuing improvement as a main corporate aim.

- Labour and their representatives should co-operate with management in promoting chemical safety and should be provided with effective means (structures and processes) to do so.

2.a.11 The Safety Policy should be made accessible to the public.

2.a.12 Each site within an enterprise should develop and update its own safety programme, which conforms to the enterprise's Safety Policy and which addresses, in greater detail, safety concerns and requirements specific to that site. This programme should be developed with the active participation of employees at all levels and be subject to regular review.

- The responsibility for day-to-day management of safety should be in the hands of line management at individual installations.

- Line management should respond to, or pass along to their supervisors, the proposals and suggestions of labour and their representatives related to safety matters.

- Senior management should provide the necessary support to line management for safety-related decisions and actions.

2.a.13 The development and implementation by an enterprise of a Safety Policy, as well as practices relating to accident prevention and preparedness, should be co-ordinated and integrated with the enterprise's activities relating to other aspects of occupational safety, health and environmental protection, as part of a total risk management programme.

- Efforts should be made towards the integrated management of safety, health and environment (SHE) throughout the regular business operations of an enterprise. This will, in general, contribute to sustainable development. In this regard, it should be recognised that it is not possible to have sustainable development without a high standard of safety, health and environmental protection.

- Safety management should be an integral part of total quality management (TQM).

- The integration of management systems for environmental, health and safety issues, and the development of enterprise-wide procedures applicable to all sites, lead to improvements in safety. The use of such procedures can help to identify situations that could result in occupational injuries, as well as organisational failures or other errors that could result in releases of hazardous substances.

Safety management systems

2.a.14 Management should establish a safety management system (as a fully integrated part of its general management system) that addresses chemical accident prevention, preparedness and response. The safety management system should include the organisational structure, practices, procedures and resources for implementing the Safety Policy.

- An effective safety management system is good business practice. There is evidence that an effective safety management system provides direct and indirect financial benefits by, for example, reducing the costs associated with lost-time accidents and shutdowns, improving goodwill, reducing insurance premiums.

- The safety management system should reflect the safety culture of the enterprise and there should be a top-down commitment to the system from the highest level of the enterprise.

- There should be a bottom-up commitment to the safety management system by all employees. The enterprise should involve employees and their representatives in the development of the safety management system so that they can develop a sense of ownership and trust in the system.

- Adequate resources and personnel should be allocated for the implementation of the safety management system. There should be a clear allocation of responsibilities for each element.

2.a.15 The safety management system should address at least the following areas:

- Organisational structure (including the roles, responsibilities, training, education, qualifications, and inter-relationship of individuals involved in work affecting safety).

- Identification and evaluation of hazards (developing and implementing formal procedures to systematically identify and evaluate hazards – including their likelihood and severity – arising from normal and abnormal operations, and including the hazards arising from substances handled, produced, transported, stored, or disposed of).

- Facilities and operational control (addressing design and construction, as well as the procedures for safe operation, including maintenance of plant, processes, equipment and temporary stoppages).

- Management of change (planning and controlling changes in: organisation; personnel; plant; processes, including pre-start up reviews, maintenance and decommissioning; materials;

equipment; procedures; software; design; and external circumstances that are capable of affecting safety).

- Planning for emergencies (related to developing, adopting, implementing, reviewing, testing and, when appropriate, revising and updating emergency plans).
- Monitoring performance (concerning the ongoing assessment of compliance with the Safety Policy and safety management system, and mechanisms for taking corrective action in the event of non-compliance).
- Audit and review (addressing the periodic, systematic assessment of the Safety Policy and effectiveness and suitability of the safety management system).
- Accident investigation and learning from experience.

Safety reporting

(*See paras.* 3.*a.*11 – 12 *related to the role of public authorities*)

2.a.16 Management of hazardous installations should prepare reports describing the significant chemical hazards at these installations, and demonstrating that appropriate steps have been taken to prevent chemical accidents and to limit their consequences.[4]

2.a.17 These reports should demonstrate that appropriate steps are being taken to manage chemical hazards. The reports should be reviewed regularly and updated, as appropriate. They should include a description of, or a reference to, documents addressing:

- The installation, including its purpose, activities, layout, intrinsic hazards, hazardous substances, personnel, services, and technical equipment.
- The area surrounding the installation, including sensitive environments, the population and activities in the area (including commercial, residential and industrial activities).
- Hazard identification and risk assessment of the installation (*see Section 2b on Hazard Identification and Risk Assessment*).
- The on-site emergency plan, including the relationship with off-site plans and communication and co-ordination with emergency response personnel (*see Chapter 5, section b on Emergency Preparedness and Planning - Industry*).
- The corporate Safety Policy (*see paras.* 2.a.7 – 13).
- The enterprise's safety management system (*see paras.* 2.a.14 - 15).
- The procedures for internal reporting of incidents (*see Chapter 14, section c on Incident Documentation and Reporting – Industry*).

2.a.18 These reports should be submitted for review by public authorities.

b. HAZARD IDENTIFICATION AND RISK ASSESSMENT

Risk assessment, in this context, is a tool used in risk management to help understand risks and inform the selection and prioritisation of prevention and control strategies. With risk assessment, risks can be ranked on a relative scale and technical/organisational/policy options can be evaluated, so that results can be maximised in terms of increased safety. This helps in the choice of options. Risk assessment also provides information to policymakers to help them develop risk acceptability or tolerability criteria against which different objectives or programmes can be assessed.

Risk assessment is a process that consists of a number of sequential steps, i.e.: hazard identification; event scenario assessment; consequence assessment; likelihood assessment; and risk integration and comparison.[5]

- 2.b.1 Management should undertake hazard identification and risk assessment for all hazardous installations.

- 2.b.2 When undertaking a risk assessment, management should carefully consider the various possible approaches and methods available. They should choose an approach/method that is appropriate for the particular circumstances, since all approaches/methods have strengths and weaknesses and none is perfect.

  - The choice of a particular approach/method should be governed by a number of factors, including:
    - the objective/purpose of the risk assessment;
    - the estimated nature of the risk;
    - the availability and adequacy of data;
    - the expertise and resources needed for a particular approach/method, and their availability;
    - the history of incidents at the installation and other related installations;
    - unavoidable constraints on the process;
    - the socio-political context in which the assessment will be carried out; and
    - the assumptions on which the approach/method is based.

  - There should be a clear statement of objectives for any risk assessment activity, so that an appropriate risk assessment approach/method can be selected.

- 2.b.3 Risk assessments should be accompanied by information concerning the assumptions, data limitations and uncertainties imbedded in risk assessment approaches/methods, as well as in decision-making processes, so that the results of risk assessments can be appropriately utilised.

  - It is important to address possible data limitations and inappropriate selection of data in order for the results of the assessments to be reliable and comprehensive.

  - For example, there may be gaps and inadequacies in the data available on, for example, equipment failure rates and modes, human error predictions, long-term or delayed health effects of acute exposures, and the effects of chemicals on the environment.

  - Data limitations can be managed, in part, through the use of less detailed, more generic approaches/methods, or the use of comparative assessments to aid in choosing among alternatives options. The use of comparative assessments normally involves similar assumptions, limitations, and uncertainties and therefore their effect on the assessment results is dissipated.

- 2.b.4 All parties should strive for greater clarity in the assumptions underlying an assessment of hazards and risks, and for transparency in the assessment process, to permit better communications and understanding and to allow for comparisons.

- For assumptions that cannot be eliminated, it is advisable to seek consensus with all parties involved in the decision-making process. Failure to do this can lead to a lack of credibility and support for the assessment.

- Any efforts towards improving consistency and communication concerning risks should take into account the various methods used by different countries and organisations.

2.b.5 The affected stakeholders, including representatives of the public, should have a role in the risk assessment process, particularly with respect to the evaluation of the significance of the results. The decisions that are influenced by risk assessments may be of fundamental importance to, *e.g.*, employees, the public potentially affected in the event of an accident, and emergency response personnel.

- Involvement by stakeholders is important for reaching appropriate decisions, building confidence in the results, and facilitating open and constructive dialogue.

- The risk assessment process should be transparent, with awareness by all stakeholders of the strengths and limitations of the risk assessment process and the approaches/methods used.

- The fact that the people who make decisions concerning risk management may be different from those who assess risks dictates the need for transparency in the risk assessment process and a shared understanding of the concepts that underpin risk assessment terminology.

2.b.6 Accident scenarios considered as part of the risk assessment process should take into account the possibility of human and technological errors, as well as the possibility of natural disasters and/or deliberate acts (*e.g.*, sabotage, terrorism, vandalism or theft) triggering a chemical accident.

2.b.7 Risk assessments related to hazardous installations should take account of all possible consequences, including environmental consequences (as well as possible health consequences).

- When death/health consequences are used as the sole parameters in the risk assessment process, the process may result in misleading or otherwise inadequate conclusions.

- Management and public authorities should be proactive in trying to improve risk assessment with respect to environmental consequences of chemical accidents.

- The task of assessing environmental risks is complex, but this is not a reason for avoiding it; rather, efforts should be made to tackle the problem, starting with simple models that can be developed over time.

- Assessing environmental consequences of accidents is complex largely because of a lack of sufficient data and tools for making such assessments and for identifying means to prevent and mitigate environmental consequences. Challenges include:
  - the large number of possible environmental receptors (*e.g.*, flora, fauna), and a lack of understanding of how each of these are affected by exposure to chemicals;
  - the large number of possible pathways (*e.g.*, soil, ground water, surface water, air);
  - the limited understanding of how chemicals could move, disperse, react, and transform in the environment; and
  - insufficient data on the environmental aspects of past accidents.

- Often, substances that are not expected by themselves to be hazardous to the environment can, in combination with other substances and/or factors, create significant hazards, or there can be synergistic effects involving small quantities of chemicals causing significant impacts.

- Efforts should be made to share experience among countries with respect to the development and application of methods and tools for the assessment of environmental risks.

2.b.8 Risk assessment should be a continuous and evolving process. Assessments should be reviewed and reassessed periodically, and when there are indications that a revision may be needed.

- A risk assessment may need to be revisited when, for example:
  - there are new or changed processes at hazardous installations, or significant changes in transport of hazardous substances;
  - incidents occur;
  - new technology offers scope for improvements;
  - the experience of labour and/or management is at odds with the risk assessment;
  - new information about the behaviour or effects of substances and processes becomes available; and
  - there are proposals for new construction or other developments inside the premises of the installation or nearby.

- Furthermore, risk assessments should be reviewed routinely to test assumptions, to try to resolve uncertainties, and to take advantage of experience and improvements in methods.

2.b.9 Enterprises and industrial organisations should exchange information concerning risk assessment methods and outcomes so that competence in the use of risk assessment approaches/methods is enhanced. Such information exchange can also be used to facilitate training to increase the expertise available. [6]

c. SITING, DESIGN AND CONSTRUCTION

Siting of installations

(*See Section 3.b and Chapter 6 related to Land-Use Planning*)

2.c.1 Management of an enterprise, when choosing possible sites for new hazardous installations, should abide by land-use planning and zoning requirements and guidance. Management should seek sites which would minimise the adverse effects to health, the environment and property in the event of an accident at the installation or as a result of transport of hazardous substances to and from the installation. Management and public authorities (in particular, those responsible for land-use planning decisions) should co-operate in order that hazardous installations are located and built so as to minimise the risks to human health, the environment and property.

2.c.2 Management of an enterprise proposing to construct a new hazardous installation or make a significant modification to an existing installation should develop a scale plan of the proposed development. This scale plan should reflect information made available by public authorities and should show:

- the locations and quantities of the hazardous substances present on-site relative to the surrounding area;
- the nature of land-use in adjacent areas;
- the local population and areas of local environmental significance; and
- the potential off-site effects posed by their proposal.

- Management should also describe details of the processes which will involve hazardous substances, the inventory of hazardous substances to be stored, and the conditions under which the hazardous substances are to be handled. Furthermore, management should develop an assessment of the consequences for human health and the environment from the proposed installation.

- These assessment-related activities should be carried out in conjunction with local authorities and the public as early as possible in the process of planning for the installation so as to facilitate siting decisions and consideration of cost-effective alternatives.

- The scale plan, and related information and assessment, should be provided to the appropriate authority.

2.c.3 Management of hazardous installations and public authorities should discuss means for reducing risks at existing installations so that they comply with current land-use planning and zoning laws and guidance (*e.g.*, if the laws/guidance have changed since the installation was built, or if residential or other developments have been built in the vicinity of the installation).

- Management should make a good faith effort, as appropriate, to reduce risks at existing installations so that they comply with current laws and guidance.

- Management should try to work with other stakeholders in the community to try to prevent residential and other developments (including, for example, schools, hospitals, and shopping areas) from being built near their hazardous installations if this would lead to inappropriate risks to health, the environment or property off-site.

Design, planning and layout

2.c.4 Safety measures should be incorporated at the earliest conceptual and engineering design stages of an installation to enhance the intrinsic (inherent) safety of the installation wherever practicable.

- Employing inherently safer[7] technology in the manufacture, transport and use of chemicals (*e.g.*, reducing inventories of hazardous substances, using safer production processes, and enhancing secondary containment) increases the security of hazardous installations.

- Processes should be designed to contain, control and minimise the quantity of hazardous intermediate substances to the extent that this would increase safety. Where this is not possible, the quantity of hazardous intermediates produced should be reduced to the amount required for the next stage of production so that quantities held in storage are kept to a minimum.

- The safety measures should take into consideration the possibilities of human and/or technical errors, as well as deliberate acts such as sabotage or vandalism, occurring at an installation.

- The safety measures should make compliance with safety procedures as easy as possible.

- The design of hazardous installations should take into account the human factor and human limitations, and be in accordance with ergonomic principles. The design should take into consideration the psychological, physiological, and cognitive abilities and limitations of people who have significant tasks at hazardous installations. In this regard, the design should make the actions required by operators as simple as possible, consistent with their cognitive abilities, thus minimising the possibility of errors.

- In order to avoid designing a facility that has latent operating errors, tests should be used to determine whether the operating design of the installation is feasible and practical (*e.g.*, that it takes account of the limited quantity of information that can be processed by humans under conditions operators might face at the installation).

- Engineering design principles concerning safety apply not only to new plant and process design, but also to modifications of existing plants and processes, as well as to research activities.

- 2.c.5 To achieve a high level of safety, the design of new installations and significant modifications of existing installations should incorporate the relevant, most up-to-date international standards, codes of practice and guidance established by public authorities, enterprises, industry and professional associations, and other bodies.

  - Such standards, codes of practice and guidance should, however, be considered minimum requirements. Improving safety is a dynamic process that should reflect advances in knowledge and technology. Therefore, these standards, codes and guidance should be supplemented by guidance developed from within the enterprise (embodied in in-house engineering design guides and specifications) as a result of operational experience and specialist knowledge.

  - Existing installations should be assessed to determine whether they meet these standards, codes and guidance. Where they do not meet the standards, appropriate improvements should be carried out as soon as practicable.

- 2.c.6 The design of a hazardous installation should integrate the appropriate equipment, facilities and engineering procedures that would reduce the risk from hazards as far as is reasonably practicable (*i.e.*, all measures to reduce risk should be taken until the additional expense would be considered to far exceed the resulting increase in safety).

  - In this regard, consideration should be given to the use of "inherently safer" process and installation design to reduce risk. Inherently safer approaches involve careful selection of the process, along with good design of the installation (in effect designing out certain hazards, minimising the effects of human error and better tolerating errors which might occur). Such approaches include the following concepts, to the extent that they decrease overall risk:
    - reducing inventories of hazardous substances;
    - minimising, to the extent practicable, the use of hazardous substances;
    - replacing hazardous materials by less hazardous ones;
    - using hazardous materials or processes in a way that limits their hazard potential (*e.g.*, through closed systems, using less reactive substances);
    - making the plant and process simpler to design, build and operate;
    - moderating process conditions (*e.g.*, pressure levels);
    - shifting complex systems to simpler ones;
    - adapting the nature and extent of transport within, to, and from the installation;
    - ensuring use of redundant safety systems; and
    - minimising production of hazardous wastes.

  - Systems designed specifically to increase process safety dealing with, for example, pressure relief and fire and explosion detection, should be included in the engineering design of new and existing hazardous installations, taking into account possible accident scenarios.

  - Hazardous installations should be designed to prevent or minimise the exposure of employees to hazardous substances, thereby reducing the need for personal protective equipment.

  - For equipment critical to safety (such as pressure vessels or control instruments), engineering design should be subject to a recognised certification or verification procedure.

  - In the design of hazardous installations, consideration should be given to the provision of redundant safety-related utility supplies (such as electricity for control systems).

  - Consideration should also be given to maximising protection of vulnerable parts of the enterprise in order to avoid damage from external forces (*e.g.*, sabotage, terrorism, vandalism, theft).

- 2.c.7 The principles of inherently safer design should not be used in isolation, but rather should be part of an integrated approach to safety.

  - This involves operation and maintenance of the installation and the application of safety management systems, and includes consideration of, *e.g.*, the continued integrity of equipment over time, personnel management, management of change, training of operators and other employees, reviews and audits of safety performance, learning from experience, and the establishment of a safety culture.

  - Good design should be complemented by proper safety management systems, including: training, retraining and education of employees; appropriate development, implementation, review and updating of operating procedures; careful management of design changes; consideration of the implications for safety when there are management or other employee changes; and audit and control procedures.

- 2.c.8 Although emphasis should be on inherent safety in design and operation, consideration should also be given to the need for "add-on" protective systems, thereby assuring safety through mitigation measures.

  - Procedures should be designed to minimise the chance of failure and, should there be a failure, to prevent or minimise adverse effects.

  - Systems/mechanisms to contain leaks, spills or firefighting waters (using, for example, containment walls or catch basins) should also be incorporated in the design of hazardous installations, bearing in mind the quantity of hazardous substances which could be released. Such systems/mechanisms could also include an increased number of barriers to prevent the release of hazardous substances, *e.g.*, double encapsulation.

  - If there is a loss of containment, adverse effects may be minimised by other mitigation measures, such as using fire protection equipment and emergency procedures.

- 2.c.9 Systems should be designed so that individual component failures will not create unsafe process conditions (*i.e.*, they should be "fail safe") and/or will be capable of accommodating possible human errors. When employees are well-trained, they can be expected to react appropriately in abnormal and unexpected situations, especially when they have some time to recover. Therefore, the design of a hazardous installation should take this into account and allow a certain amount of time for the operator to react, before there is further deterioration, when there is an abnormal situation.

- 2.c.10 An appropriate level of automation, and decision support systems, should be incorporated into the design of a hazardous installation.

  - Full automation is neither realistic, nor optimal, from a safety perspective. While automation and decision support systems can increase safety due to rapid diagnosis and response, such systems only address "known" or predicted abnormal events. Events which are not within the design specifications, or which were not predicted, need to be dealt with manually. Thus, the presence of an operator who is well-informed and well-trained to respond is indispensable.

  - If the system is automated to the extent that the operator has very limited responsibilities, the operator may not be sufficiently aware or experienced to handle rare abnormal situations. Safety can also be compromised if the responsibilities of the operator become too routine, or if the operator does not have sufficient opportunities to utilise his/her skills.

- Notwithstanding the level of automation, there is still a need to maintain sufficient levels of staffing both to have a regular presence in the operating unit (not just at remote computers) and to have sufficient personnel to handle emergency situations.

(*See paras. 2.d.10 – 17 related to personnel*)

- 2.c.11 Computer systems can be an important component of operating safety.

  - On-line systems should support operators in carrying out their responsibilities and in providing easy and rapid access to operating procedures and related information.

  - On-line systems should also be able to capture information useful for determining the root causes of incidents, while off-line systems should provide easy and rapid access to documentation on the enterprise, for emergency planning, and for training and education.

2.c.12 Safety systems, whether automated or requiring human intervention, should be designed and tested so that critical signals get through to the operator (even when there are several simultaneous failures), and so that the systems cannot be overloaded and therefore fail to work.

- For example, consideration should be given to whether the operator may be inundated with signals if several systems in an installation fail at the same time, leading to confusion from too much information and an inability to determine an appropriate course of action. In this regard, highly integrated information is more difficult to interpret than individual data points.

- In designing the safety systems, it is critical to take into account the possible psychological effects on a manager or an operator when systems fail, and how such stress will affect their ability to react.

- 2.c.13 In the design phase, management should ensure there is adequate consideration of the site layout guided by overall safety goals. Particular regard should be given to:

  - The establishment of safe separation distances to minimise any "knock on" or "domino" effects[8] either on-site, within the boundaries of the installation, or off-site involving other enterprises.

  - The location of hazardous processes and substances relative to the location of personnel and to critical safety-related equipment and instruments.

  - The location of offices, control rooms and other premises so as to minimise the adverse effects to health and increase the ability to maintain control of the installation in the event of an accident.

  - Possible effects on the local community and environment.

- 2.c.14 A storage facility, or any hazardous installation that stores hazardous substances, should be designed taking into account the nature and extent of hazardous substances to be stored in the facility.

  - The design of storage facilities should incorporate safety features in order to minimise the likelihood and extent of an accident involving hazardous substances. In this regard, the design should allow for the separation of incompatible substances and subdivision of inventories by the use of, for example, separate buildings or fire walls. Furthermore, the facility should be designed in a way that reduces the likelihood of domino effects should an accident occur.

  - Particular attention should be given to incorporating automated systems for handling hazardous substances, which reduce the risk of an accident involving such substances.

- In addition, the design should enable access for inspection of hazardous substances and permit firefighting and effective evacuation. Fire protection equipment should be available and adequate catchment facilities (*e.g.*, bunded areas) should be provided to facilitate the activation of spill mitigation procedures, in order to protect the people and environment in the event of an accident. Security measures should also be in place, such as fencing and limited access to unauthorised personnel.

- Efforts should be made to minimise the quantity of hazardous substances at a storage facility, to the extent consistent with reducing the overall level of risk.

2.c.15 Care should be taken to ensure that design choices or modifications do not inadvertently increase or transfer risk. For example, in some cases reducing inventories of hazardous substances may increase overall risk due to the need for more frequent transport and handling (*e.g.*, loading and unloading) of the substances.

2.c.16 Relevant personnel who will be involved in the operation of a hazardous installation should also be involved in the planning, design and construction phases of the installation. Employees, and their representatives, should participate in decisions concerning the design of their workplace, and should be given the opportunity to provide input in the design, application and improvement of equipment so that employee know-how and experience can be utilised.

2.c.17 The management of hazardous installations should collate all safety-related information on the process and associated equipment concerning, for example, design, operation, maintenance and emergencies.

- Such a file or dossier is essential for training, as well as operational purposes.

- The file or dossier is also needed for developing safety reports, which may be required by public authorities, and for inspections/control by public authorities.

- The operating concept/procedures should document the safety features incorporated in the design (including automated safety systems), as well as the role of operators, managers, maintenance staff and others. In addition, this process documentation file or plant dossier should include information concerning:
  - manufacturing procedures;
  - process and operating instructions (including safe start-up and shutdown);
  - line diagrams of process flow showing key equipment;
  - quantities and properties of substances produced, stored or handled on-site;
  - results of safety tests and safety data on raw materials, solvents, catalysts, intermediates and by-products, and reaction materials and products;
  - secondary reactions and chemistry;
  - data resulting from hazard studies; and
  - waste treatment (containment and disposal).

- The process documentation file or plant dossier should be kept up-to-date.

Construction

2.c.18 The management of a hazardous installation should pay particular attention to quality assurance during the construction phase of a project.

- Safety checks and inspections should be routinely carried out during the construction phase to ensure that the integrity of the original design is maintained. This involves checking to see

that plans are being followed properly, requirements of the hazard studies are being fully implemented, and associated equipment is being correctly installed. It also involves checking that correct materials, methods (such as welding techniques), and tests (such as pressure/leak tests) are being used by suitably qualified personnel (employees and contractors), in accordance with recognised standards.

- Any modifications to the original design of an installation should be documented, and these modifications should be reflected in quality assurance and safety reviews prior to commissioning and start-up of the installation.

- Quality assurance (QA) systems can provide useful tools to ensure the conformity of equipment with standards and other requirements.

- 2.c.19 Safety checks should also be carried out at the commissioning and start-up phases of a project to ensure that the design intent has been completely fulfilled. Functional tests should be carried out for all components, controls and safety devices critical to the safety of the installation.

- 2.c.20 An enterprise should purchase equipment only from reputable suppliers, and should formally inspect equipment to ensure that it conforms to design specifications and safety requirements before being put into use. Information concerning reliability of suppliers should be shared among enterprises.

- 2.c.21 In the construction of a hazardous installation, an enterprise should do business only with contractors who are able to satisfy the enterprise that their services will be carried out in compliance with all applicable laws and regulations, as well as in compliance with relevant safety standards and policies of the enterprise, so as not to increase the risk of an accident involving hazardous substances. Contractors should work to the standards set by the management of the installation and, to the extent appropriate, under the direct surveillance of management.

d. OPERATION

Procedures

- 2.d.1 Management should ensure that appropriate organisational arrangements for implementing the corporate Safety Policy are established. The line of prime responsibility for the management of safety in the enterprise and the authority for affecting change, as well as individual responsibility for safety, should be clearly defined. The roles and responsibilities of all employees (*i.e.*, management and labour, including contractors) related to safety should be clearly identified.

- 2.d.2 Management should ensure that each installation in an enterprise has written and easily accessible operating procedures and instructions, in order to establish the conditions necessary to satisfy the design intent of the installation and maintain its integrity. These should take into account relevant standards, codes and guidance in order to ensure that equipment, plant and premises provide a safe place of work under both normal and abnormal operating conditions.

  - The written procedures should be understood by all relevant employees (including contractors). There should be education, training, review and monitoring systems for ensuring that all employees know, understand and follow at all times appropriate procedures, and that these procedures are periodically reviewed and updated to take into account any significant changes in plant design or operation.

  - Operators, maintenance staff and others with safety-related tasks at the installation should be involved in the development and maintenance of procedures. This helps ensure that

procedures are realistic, workable and consistently applied, and facilitates the idea that those who have to follow procedures "own" them.

- All appropriate employees should be aware of any modifications to the plant.

2.d.3 Procedures and arrangements should be introduced at a hazardous installation for the prevention of fires, as well as for the prevention of releases of hazardous substances. Furthermore, there should be appropriate arrangements for the protection of personnel, buildings and equipment and for response (*e.g.*, firefighting) should a fire or release occur.

2.d.4 Procedures should exist to ensure effective protection against accidents involving hazardous substances during abnormal conditions. Abnormal conditions could include, for example: when critical instruments, alarms and emergency equipment are not functioning; when there are unusual (short-term) production demands, extreme overtime work or a slow-down in production; when there are resource constraints (including staffing and financial resources); or when there are emergency shutdowns or evacuations.

2.d.5 Management should ensure that all employees have personal protective equipment, where necessary, and ensure that such equipment is maintained in good condition.

- Management should also ensure that regular training is provided in the use of personal protective equipment.

- Employees should be responsible for using suitable personal protective equipment in accordance with safety procedures and policies.

- Efforts should be made to design installations so that the need for personal protective equipment is minimised.

(*See paras.* 2.*c*.4 – 17 *related to design, planning and layout of installations*)

2.d.6 Procedures should be established at storage facilities, and facilities where hazardous installations are present, to minimise the risks of accidents and, in particular, to prevent degradation of hazardous substances or packages, labels or other markings.

- The warehouse keeper should ensure that all relevant legislative requirements and applicable codes of practice for the safe storage of hazardous substances are strictly applied, wherever applicable.

- In order to prevent explosions and fires, consideration should be given to whether the conditions of storage (including, for example, temperature and pressure) create special risks. Consideration should also be given to avoiding potential sources of ignition, such as smoking, welding, and shrink wrapping equipment. All power equipment should be specially protected, as necessary.

- A storage plan should be drawn up by the warehouse keeper showing the nature of the hazardous substances in each part of the storage facility.
  - the storage plan should be made available to employees and relevant local authorities (for example, fire services);
  - information concerning hazardous substances held in a storage facility should be maintained up-to-date and should be easily accessible to employees, labour representatives and emergency responders.

- Where storage is the responsibility of a third party (off-site), the owner of the hazardous substances (products, raw materials and intermediates) should satisfy himself as to the

suitability of the facility for the storage of such substances, and of the competence of the warehouse keeper to undertake the storage required in a safe manner. This could involve the owner/supplier of the substances monitoring the storage facility and training employees of the off-site facility.

- the owner/supplier of the hazardous substances being stored should provide the warehouse keeper with the information necessary to prevent accidents and to respond appropriately should an accident occur, including information concerning reaction and/or decomposition products formed in the event of a fire;
- in this regard, the owner/supplier should provide a material safety data sheet (MSDS) or product data sheet so that the warehouse keeper can ensure that physical, chemical and (eco)toxicological, and other properties relevant in the case of an accident, are understood by all relevant employees working in the storage facility;
- particular attention should be given to proper labelling and marking of hazardous substances, indicating any hazardous properties on labels and the appropriate precautions to be taken; and
- the owner/supplier should ensure that incompatible substances are segregated.

2.d.7 Appropriate arrangements should be in place for maintaining the security of a hazardous installation to minimise the possibility of deliberate releases from, for example, terrorist activities, sabotage, vandalism or theft of hazardous substances. The management of the hazardous installation should specify the areas of the installation to which access should be restricted or controlled, and implement measures to maintain control and prevent unauthorised access.

2.d.8 A high standard of housekeeping and operational efficiency should be maintained at hazardous installations, including storage facilities, since there is a clear correlation between these functions and good safety performance.

2.d.9 Management should ensure that relevant written, agreed operating procedures and safety instructions accompany new products, processes or equipment before they are handed over from one department to another (or from one owner to another) so that knowledge and experience gained in research, development, pilot plant and production are passed on. This handover should be formalised by an appropriately signed handover/clearance report.

- This would apply, for example, when a product or process passes from a research or development phase to full production, or when there is a handover from production to maintenance or back from maintenance to production.

- Operating procedures and safety instructions should also be provided whenever installations, or technology, are transferred.

(*See paras.* 2.i.7 – 10 *on transfer of technology*)

Personnel

2.d.10 Management should be responsible for ensuring that each operation is staffed at a sufficient level, and in a manner which allows for the safe operation of installations at all times.

- Consideration should be given to the ability of employees to fulfil their responsibilities in a safe manner (taking into account both physical and psychological factors), including employees whose activities are largely sedentary, such as managers and control room employees. In this respect, employees should not be assigned tasks if such assignments may compromise the safe operation of the installation.

- Jobs that are unsuitable for disabled or restricted employees, pregnant women or young employees, due to the risk of an accident involving hazardous substances, should be identified.

- Employees, and their representatives, should participate in decision-making concerning the organisation of their activities and the staffing needs of the installation, to the extent that these may affect safety.

- In this regard, management should consider instituting mechanisms for "peer review" of safety performance.

2.d.11 Management should give special consideration to ensuring sufficient staffing and supervision during nights and weekends, and during periods when there are difficult or unusual situations, as well as to controlling overtime work or irregular work patterns if these may present an increased risk of an accident involving hazardous substances.

- In planning staffing schedules, consideration should be given to avoiding stress of personnel and overwork. For example, hours of work and rest breaks should be compatible with safety requirements. Overtime and rest day working by any individual should not be excessive. A record of all such abnormal hours should be maintained to facilitate control of hours worked.

- Management should identify and address the need for special staffing requirements and technical skills posed by start-ups, shutdowns, abnormal or unique operating situations, periods when there are unusual production demands, resource constraints or emergency situations, or other situations that might create stress in personnel.

2.d.12 Consideration should be given as to whether certain tasks, because of their relationship to prevention of accidents, should be subject to specific management controls; for example, a requirement for a specific authorisation, permit to work, or license for activities such as pressurising tanks and welding.

2.d.13 Management should take measures to avoid a situation in which jobs that are critical for safety become too routine or too limited in responsibilities.

2.d.14 Specific policies with respect to personal activities that may affect the safe operation of an installation - such as smoking, substance abuse and similar matters - should be agreed on and included in every individual employee's contract or conditions of employment.

2.d.15 Management should not engage contractors to perform jobs related to the operation of a hazardous installation if this would compromise safety.

- Management should only hire contractors who are competent to carry out the contracted work in accordance with all applicable laws and regulations, safety policies and standards of the enterprise, and any additional practices particular to their task.

- Before contracts are given, management should obtain evidence that the contractors are capable of performing their tasks to a sufficiently high standard of safety. Compliance with relevant laws, regulations, safety policies and standards should be an integral part of the contract with contractors.

- Management should monitor the safety performance of their contractors and, in general, contractors should be subject to the same safety management systems as staff at the enterprise.

2.d.16 Contractors hired to perform duties related to the operation of a hazardous installation should have equivalent rights and responsibilities with respect to safety as staff at the enterprise. If

necessary, special measures should be developed to ensure that contractors are well-informed of the hazards when operating at hazardous installations. Specific site safety information should be made available to them.

- 2.d.17 Consideration should be given to whether reductions in manning levels, related to both labour (such as operators) and management, may have an adverse effect on safety.

  - This is an important issue since economic conditions can lead to reduction in the number of employees and changes in corporate structures.

  - Reductions in staff manning levels do not necessarily affect safety since there are other factors involved, including design, management and operation. However, it is possible that staff cuts can lead to reduced safety communications, a disconnect between policy and hands-on action, increased stress, and less time for training, voluntary inspections, and time-off between shifts. It can also result in the loss of experience and a greater number of operators working alone rather than with colleagues.

- 2.d.18 Safety performance should be considered an essential component of every manager and other employees' overall performance and should be reviewed periodically. The role of managers and labour (at all levels) regarding safety should be clearly defined so that safety performance can be appropriately monitored and reviewed.

- 2.d.19 Co-operation between management and labour, at all levels, is essential to assuring safe operation of hazardous installations.

  - Management should encourage, and facilitate the ability of, labour to fulfil their roles and responsibilities.

  - Labour may avail themselves of the experience and support of unions, confederations and their international organisations to assist them.

- 2.d.20 Management of hazardous installations should take all reasonable measures to inform on-site employees, including contractors, of the hazardous substances to which they may be exposed. Adequate information on hazards (including emergency exposure levels) and on the procedures to be followed for safe handling of all substances at the installation (including those used, manufactured as intermediates, stored, or available for sale), should be obtained, kept up-to-date and disseminated widely, in a language(s) which all employees can understand.

  (*See paras.* 2.*d.*25 –33 *on internal communication and paras* 2.*d.*34 – 41 *on education and training*)

- 2.d.21 Efforts should be made to ensure that employees are informed of, and participate in, activities concerning their work environment including, for example, maintenance, testing and calibration. In addition, they should be trained, and involved, in related activities such as design of work areas, risk assessments and audits of facilities.

- 2.d.22 Plans for personnel development and rotation of jobs should always be consistent with maintaining operational safety requirements. This applies to employees at all levels, including management.

- 2.d.23 Sufficient professional safety personnel should be available within an enterprise. Their role should be to remain impartial and independent of line management, to provide expert advice and, as such, to function as the enterprise's safety conscience.

  - In this regard, safety professionals should:

- have the necessary authority to carry out their responsibilities, and should be seen as having management support;
- interact with, and be respected by, employees at all levels in the enterprise;
- be technically competent, either through specialised training or adequate experience (preferably both); and
- possess good interpersonal and communication skills.

⏩ The number of safety professionals should be appropriate for the size, technology and complexity of the enterprise.

⏩ Management should consider rotating employees between line management and the safety function in order to increase understanding of safety-related problems, generate better solutions to safety-related problems, and strengthen the safety culture within the enterprise.

■ 2.d.24 Each employee should be responsible for following the procedures laid down by management, and for taking reasonable care for his or her personal safety and the safety of others who may be affected by his or her acts or omissions at work.

⏩ Each employee should support the ability of others to carry out their jobs in a safe manner, and co-operate actively with management in the application of safety procedures and arrangements.

⏩ It is important for employees at all levels to be given the education, training, and resources they need to carry out their tasks and, at the same time, for them to accept responsibility (and be held accountable) for carrying out their tasks, both as individuals and as part of a team.

⏩ While the individual has responsibility for his/her own safety performance, the enterprise has to provide the conditions that allow the individual to act responsibly and effectively.

⏩ Experience suggests that safety benefits when an organisation gives employees responsibility in an atmosphere of trust, and provides the tools needed to work and to make decisions.

Internal communication

■ 2.d.25 Effective two-way communication channels for the transfer of safety information between management and labour should be established at hazardous installations.

⏩ This will help create and maintain a high level of motivation for all employees to operate the installation safely.

⏩ Care should be taken to ensure that important communication linkages are not blocked by, for example, language differences or a presumption that certain employees or contractors do not care or cannot understand relevant facts.

■ 2.d.26 The regular communication channels should be reinforced by the establishment of Safety Committee(s) to provide a formal mechanism for consultation between management, labour and their representatives on safety matters. The Safety Committees should support - but not be a substitute for - direct communication between management and labour, and individual and line management responsibilities for safety. The use of such Committees makes it possible to obtain the maximum benefit from employees' practical experience and knowledge, and to further mutual trust and confidence through the actions taken to improve safety.

⏩ Safety Committees should operate at different levels in an enterprise. Such Committees could, depending on the size of the enterprise, consist of:

- labour at various levels (including Safety Representatives where they exist);
- managers with the authority to implement the Committee's recommendations;
- safety specialists; and
- contractors, where appropriate.

▸▸ Safety Committee members should receive safety training and specialist advice as necessary.

▸▸ Resources should be available for the Safety Committee to undertake its activities.

▸▸ Management should act upon the recommendations of the Safety Committee, recognising that the ultimate responsibility for safety remains with management.

▸▸ Safety Committee members should not lose any earnings for time spent in activities related to the Safety Committee.

■ 2.d.27 In addition to Safety Committees at individual hazardous installations, the establishment of similar mechanisms at corporate, sectoral, national or international levels may be considered useful in helping to disseminate safety information and providing input to the relevant decision-making processes concerning safety.

■ 2.d.28 Safety Representatives at the plant level should be supported in their work. Safety Representatives, nominated by labour, represent employees in consultations with management on matters relating to safety. Safety Representatives should be given specific training related to their role.

■ 2.d.29 No measures prejudicial to an employee should be taken if, in good faith, the employee complains to competent authorities, or other employees with responsibilities for safety, of what he/she considers to be a breach of statutory requirements or an inadequacy in the measures taken with respect to safety. Management should support this approach if the necessary "open" attitude to safety matters is to be achieved.

■ 2.d.30 An employee should have the right to refuse to perform any tasks that he/she believes may create an unwarranted risk of an accident involving hazardous substances.

▸▸ The employee should immediately report to management the reasons for refusing to perform these tasks.

▸▸ In certain cases an employee, or a Safety Representative where one exists, may interrupt hazardous activities in as safe a manner as possible when he/she has reasonable justification for believing that these activities present an imminent and serious danger to safety.

■ 2.d.31 Employees should immediately report to management any situations that they believe could present a deviation from normal operating conditions, in particular situations which could develop into an accident involving hazardous substances.

▸▸ Management should investigate these reports.

▸▸ Any employee should be entitled to refer unsafe conditions to relevant public authorities.

■ 2.d.32 Employees should not be placed at a disadvantage because of the actions referred to in the two previous paragraphs.

■ 2.d.33 Technological information and assistance related to safety of hazardous substances should be provided by management of hazardous installations to contractors, distributors, transporters, customers and downstream users, as well as to employees.

Education and training

2.d.34 Management should take all reasonable measures to ensure that all those employed at a hazardous installation, including temporary employees and contractors, receive appropriate education and training and are competent to carry out their tasks under both normal and abnormal conditions.

- This education and training should address:
  - hazard identification, risk evaluation, and appropriate corrective measures to address safety concerns;
  - risk prevention and mitigation;
  - actions that should be taken in unusual or emergency situations;
  - correct materials handling procedures; and
  - any special hazards unique to their job.

- Safety training should be part of the initial induction training given to all new employees to create safety consciousness and commitment. There should also be regular follow-up training and education. During slower work periods, or as circumstances dictate, consideration should be given to using employees' free time for education and training activities.

- Training should be structured to give all employees the skills they need to do the job to which they have been assigned, and be sufficiently broad-based so that employees understand the workings of the installation, equipment, operations and processes, and possibilities for abnormal situations. The approach to education and training should create the high level of awareness necessary not only to prevent accidents but also to respond to abnormal occurrences quickly and effectively.

- Arrangements should be made to ensure that specialised training needs at all levels are properly identified and are appropriately satisfied.

- All employees should be encouraged and trained to think through their assigned tasks and how they can be carried out most safely, rather than just carrying them out mechanically. Training should make clear not only what employees are required to do, but also why certain actions are necessary for safety. In this regard, training should instil in employees the confidence to raise concerns related to safety (both technical and management issues), when appropriate.

- Labour and their representatives should be involved in the development of education and training programmes.

2.d.35 In developing and implementing training programmes, consideration should be given to the most effective methods of training for particular circumstances, including training for day-to-day operations and for dealing with unusual or emergency situations.

- Different approaches to training could include, for example, operator-to-operator training, on-line systems, and electronic simulation models. The use of simulator training provides a means for learning about the application of diagnostic and corrective actions in the operation of modern automated systems.

- Consideration should be given to training employees in groups rather than individually, where appropriate, since group training can be an effective way of instilling good safety attitudes in employees, developing positive group behaviour, and establishing increased ability for group members to predict potential safety problems and to develop solutions.

- There should be joint training activities for managers and labour to facilitate understanding of each other's roles and responsibilities.

- 2.d.36 Managers have a special obligation to keep themselves informed about safety standards and risks. They should know and fully understand the properties and behaviour of the hazardous substances being used and the limitations of the equipment and technology.

  - Managers should be competent to implement the measures to be taken in an emergency.

  - Every manager should ensure that those on his or her team know how to safely carry out the tasks entrusted to them and how to maintain a high level of safety awareness. To achieve this, each supervisor should receive training in communication techniques, safety leadership, accident investigation and reporting procedures, safety and health analyses, and the conduct of safety meetings.

- 2.d.37 Exercises should be carried out with sufficient frequency so that operators can understand emergency situations and react properly. Operational perception, especially with respect to making decisions in an emergency situation, is an important factor in operational safety. Perception can be complex, drawing on previously acquired information and on existing understanding of systems.

- 2.d.38 The nature of safety training and education needs should be analysed on a regular basis, and training and education programmes should be monitored and evaluated for effectiveness and revised, as appropriate.

  - Education and training programmes should be modified to reflect changes in processes used, technology applied, and procedures followed at an installation.

  - This evaluation and revision process is particularly important in times of change, such as when employees, including managers and supervisors, are being assigned to a new or different installation.

  - Labour and their representatives should be involved in the testing and evaluation of the education and training programmes, and their subsequent revisions.

- 2.d.39 Management should recognise the need to address possible language differences so that employees can understand the education and training, and are able to communicate with their co-workers.

  - Where appropriate, education and training should be available in languages other than the primary language used at the installation, for example where there are foreign employees or where the installation is located in a multilingual area.

  - Where employees speak different languages, management should provide the necessary language training, so that there is a common language for communication needed to operate the installation safely and to respond in the event of an emergency.

- 2.d.40 Records should be kept, and maintained up-to-date, of all safety-related education and training of all personnel, including managers and contractors.

- 2.d.41 Education and training should be considered part of employees' jobs for purposes of calculating working time and wages.

Human factors

- 2.d.42 Particular attention should be given to the role of "human factors" in preventing incidents at hazardous installations, and in being able to respond during abnormal events.

- In this regard, it should be recognised that humans will, on occasion, fail and that the majority of accidents are in some part attributable to human error, meaning human actions or inactions which unintentionally exploit weaknesses in equipment, procedures, systems and/or organisations.

- The term "human factor" is often used in a negative context (equating it to human error). However, humans are often the only means for effectively responding to abnormal situations since they have the capability to reason, and then to override automatic reactions of machines. Humans have the capacity to forecast action, integrate complex and fuzzy information, and understand how to address unusual situations based on experience and training. Thus, an employee may be able to remedy potentially unsafe situations if he/she is provided with sufficient information and training, and the workplace is designed in a way which allows him/her to take corrective action.

2.d.43 The "human factor" should be taken into account in all phases of a hazardous installation including: design, construction, hazard identification and risk assessment, operation, training and education, maintenance, shutdown and decommissioning.

- The human factor, including both positive and negative aspects of human behaviour, is applicable to all employed in a hazardous installation (*i.e.*, managers and labour, including contractors).

- Working areas, including related tools and equipment, should be designed taking into account ergonomic principles and the employee/machine interface, so that the work areas reflect employees' physical and cognitive abilities and limitations.

- The demands of tasks that may affect the safe operation of an installation should be analysed so that employees can be placed at tasks that are appropriate to their physical and psychological abilities, and to help ensure that employees are not overloaded or excessively stressed.

(*See Section 2.c on Siting, Design and Construction*)

2.d.44 Employees should be encouraged to share their experiences in order to reduce the risk of human error.

- This can be accomplished through, for example, safety workshops, discussions of near-misses and other group discussions, as well as through inspection and observation of the workplace by employees and, where appropriate, by Safety Representatives.

- Experiences relating to human errors should also be shared among different enterprises and, to the extent possible, among public authorities.

(*See paras. 2.d.25 – 33 on internal communication*)

2.d.45 Special care should be taken to avoid human errors that could lead to accidents during periods of unusual conditions or when employees might be under stress (*e.g.*, when there are unusual short-term production demands, extreme overtime work or a slow-down in production, or when there are resource constraints). Management should demonstrate that safety considerations take precedence over other considerations. Stress affecting safety could result from pressure on individuals or groups of employees or on the enterprise as a whole (for example, to increase production or to cut costs).

(*See paras. 2.d.10 – 24 on personnel*)

■ 2.d.46 Special care should also be taken during and after modifications and maintenance, during shutdown/start-up, and following outages, since human errors tend to increase during and after these periods.

(*See Sections 2.e on Maintenance and Repairs, and 2.f on Modifications*)

e. MAINTENANCE AND REPAIRS

■ 2.e.1 Management of hazardous installations should establish programmes for the regular maintenance, inspection and testing of equipment to ensure that it is at all times fit for the purpose for which it was designed.

- Special attention should be paid during periods of maintenance and repairs since there is a higher risk of accidents during such periods.
- Maintenance programmes should be adhered to strictly and should be reviewed periodically to ensure they continue to be appropriate in relation to safety requirements.
- Maintenance and repair standards and procedures should be developed to help guarantee the safety of each operation, and all jobs should be performed according to such procedures.
- Procedures should exist for lock out/tag out and hot work permitting.
- Maintenance programmes should take into account information obtained from hazard identification and risk evaluation procedures.
- Management should ensure that all contractors responsible for maintenance or repairs are aware of, and follow, all relevant standards and procedures.
- Records should be kept of all safety-related maintenance work carried out, and equipment reviews and reliability assurance procedures should be established.
- Records should be kept of any faults found during maintenance of equipment that might materially affect safety, and prompt action should be taken to rectify such faults.
- Procedures should exist for the safe shutdown and start-up of installations, for example, during maintenance of equipment. Special efforts should be made to avoid potential causes of risk such as communication problems and split responsibility; this may be a particular concern when contractors are involved (who may not be fully aware of the details of an installation's operations, policies and procedures).

■ 2.e.2 Local management at each hazardous installation should regularly inspect and maintain emergency alarms, protective and emergency equipment, and all devices critical to the orderly shutdown of operations, in conjunction with the relevant public authorities (where appropriate).

f. MODIFICATIONS (technical and organisational)

■ 2.f.1 Management of a hazardous installation should establish formal procedures to ensure that no modifications (or repairs) to plant, equipment, processes, software (including automated controls), facilities, or procedures compromise safety.

- Modification procedures should apply to both permanent and temporary changes, and should be based on appropriate up-to-date process documentation and, where appropriate, a physical inspection of the installation.

- All proposals to make modifications to a hazardous installation should be registered, documented and assessed so that the necessary hazard studies are carried out, the appropriate design changes are made, and the modifications are properly engineered and recorded.
  - proposals for significant modifications should be reviewed by competent technicians who are independent of those directly responsible for the proposals;
  - the level of management approval necessary for a modification should be based on the associated level of risk; and
  - supervisors having the authority to make a modification (for example, to change a manufacturing procedure or operating instruction), should be fully aware of the hazards involved and should consult the relevant competent specialist(s) before initiating such a change.

- Major modifications should be subject to the same notification and reporting requirements as new installations.

2.f.2 In cases where changes made to a process could affect safety - for example, use of different process materials, alterations of conditions, increase in batch size, or use of larger/different equipment - the original hazard analysis should be reviewed and the process documentation file or plant dossier supplemented accordingly.

- Procedures should also exist to ensure that changes in management, labour and organisation do not compromise safety (including, for example, changes in corporate structure or financing, downsizing of staff, outsourcing of certain production). Such changes should trigger review procedures to ensure safety has not been adversely affected.

- Techniques should be developed to assess how a series of minor changes in the installation, taken together, could affect safety, and what could be done to mitigate any increased potential for accidents.

2.f.3 Procedures should be in place for the start-up of an installation after modification, repair and/or overhaul of plant, equipment or software. These procedures should require test runs and safety checks to be carried out to ensure the integrity of the installation. The test runs should be conducted in the presence of a manager responsible for the operation of the installation. The manager should be required to formally approve the restarting of operations.

2.f.4 All relevant employees should be aware of any modifications to the installation. Any significant modifications to plant, processes, facilities, personnel, software or other aspects that might affect safety should trigger a review of training and education practices to determine whether additional training and education are needed.

2.f.5 Contractors involved in any modifications should be subject to the same procedures, including the same requirements for registration, reporting and assessment, as staff of the installation. Procedures should be in place to ensure that contractors involved in modifications inform the management of any safety-related concerns.

g. REVIEW AND EVALUATION OF SAFETY MANAGEMENT PERFORMANCE

(*See also Section 3.c, related to Safety Performance Review and Evaluation by public authorities*)

- 2.g.1 Industry should establish monitoring (*e.g.*, audit) programmes to support the continuous improvement of safety at hazardous installations.

  - The range of monitoring activities by industry include continuous assessment of environmental, health, and safety management within a facility, self-assessment by the facility, corporate audits of the facility, and third-party audits/inspections.

  - These activities provide a check to help ensure that the elements of a safety management system are in place and are being appropriately applied to achieve specified goals and objectives.

- 2.g.2 The approach to monitoring should be systematic. In this regard, a monitoring plan should be developed at each installation, "owned" and primarily implemented by the local management, with flexibility built in so that it will not become routine.

  - The monitoring plan should include regular reviews involving labour and their representatives at the workplace, periodic detailed checks on specific activities and procedures, and an overall audit of performance.

  - The monitoring plan of an installation should form the basis of a hierarchy of annual safety assurance reports, from the manager responsible for an installation to division/business/enterprise executives and subsequently to the Chief Executive Officer of an enterprise.

  - Emphasis in monitoring should be on aspects that are vital to the safety of the particular installation, as revealed by the hazard evaluations. Some general aspects will need to be covered in all monitoring, such as: organisation and management; training; plant integrity; fire protection and prevention; accident/dangerous occurrence investigation and reporting; and emergency procedures.

  - The potential level of risk should be a significant factor in determining the frequency of monitoring.

- 2.g.3 All monitoring should be defined in terms of a "feedback" loop (*i.e.*, plan, do, check, act), designed to achieve continuous improvement (while recognising that monitoring programmes can differ in terms of objectives and approaches). There are some common elements critical to the success of all monitoring (*i.e.*, audit and inspection) programmes. Specifically, they should all have:

  - clearly defined goals;
  - an identified scope, recognising that if it is too broad then it may be difficult to achieve the desired objective;
  - a schedule (including, *e.g.*, a plan of action with time-frames);
  - appropriate expert(s) who are trained and qualified for the specific tasks and goals;
  - reviews of appropriate documentation, as well as interviews with key personnel (including process operators);
  - an identification of deficiencies and proper practices;
  - a formal report of findings;
  - a management review to clearly define responsibilities and a time-scale for follow-up actions, and a means for ensuring that the actions are carried out; and
  - a demonstration that the follow-up actions have been carried out.

- 2.g.4 Efforts should be made to improve transparency in the conduct of audits, including making publicly available the relevant policies, programmes, and outcomes. This can help establish and maintain trust among stakeholders (public authorities, industry, employees, the public and others). Evidence indicates that improved public awareness of risks leads indirectly to improved safety.

- Industry should make a concerted effort to make publicly available relevant information in a form that can be readily understood, and to provide opportunities for dialogue among stakeholders (industry, public authorities, and the public).

- A statement of an enterprise's safety and health performance should form part of the yearly report that is prepared for its shareholders and employees.

(*See text box on the "Global Reporting Initiative" at the end of Chapter 2*)

- There is a need to help the public better understand the nature of "risk" and the risks posed by hazardous installations.

2.g.5 Consideration should be given to including representatives of the community (including, for example, emergency response personnel) in audit activities. This could help to improve the level of trust between those responsible for operating a hazardous installation and the local community.

2.g.6 Industry should share information - within countries and internationally - on the methodologies and tools used in inspections and audits, and on the outcome of specific inspections and audits. Efforts should be made to promote such activities on an ongoing basis, and develop mechanisms that could be used to facilitate information sharing.

2.g.7 Efforts should be made to use more leading performance indicators as one way to measure safety and determine whether actions being taken are actually leading to reduced risk. Furthermore, such indicators could help to focus audits and inspections on areas with highest priority.[9]

2.g.8 All enterprises should establish monitoring programmes, consisting of several levels of audits, to check various technical and management systems within an installation. Such monitoring programmes allow management to review their operations to ensure that no previously unrecognised risks have been introduced and that there is the required degree of compliance with relevant national and international legislation, standards, codes and guidance, as well as with the enterprise's own requirements and guidance. In addition to identifying any deficiencies or potential problems in the installation, the audit should also recognise successful actions, learning experiences, and improvements made with respect to safety.

- An audit at the plant level can provide detailed understanding of the daily activities of process operators and provide insights by those familiar with the systems, whereas an audit conducted by corporate headquarters or a third party can identify potential problems that might be overlooked by those directly involved in the operations, identify potential problems in the enterprise's organisational structure or in its audit system, and help generate new ideas for improvements.

- Audits can reveal needs for additional, new or improved standards, hardware and/or procedures. Furthermore, they can provide: a management or strategic tool to define priorities for the allocation of resources; a mechanism for sharing information and experience on best practices; a support to line management in the implementation of their responsibilities; a means for identifying improvements in safety; input into a dialogue with public authorities and the public; and a mechanism to determine if internal policies or legal requirements are being met.

- Audits should be one element of an enterprise's safety management system.

- Audits also provide a basis for reviewing the adequacy of the safety management system and revising it, as appropriate, to ensure that it continues to make sense and is consistent with best practice.

(*See paras. 2.a.14 – 15 on safety management system*)

- 2.g.9 Management should, as appropriate, utilise independent experts to monitor hazardous installations. Using third-party experts can be a valuable means, in certain cases, of raising safety performance by providing an independent viewpoint.

  - In establishing monitoring programmes, consideration should be given to whether certain audits should be carried out by an independent third party, depending on the purpose and nature of the audit.

  - Insurance companies could provide a useful service in this respect, especially to small and medium-sized enterprises.

- 2.g.10 Audits should include interviews of key employees, including labour and management. Such interviews help to check that the employees understand the operating procedures and are carrying out their tasks according to these procedures. They also help provide insights as to whether the employees recognise the hazards involved and their role in controlling them. In addition, the interviews help to determine whether there is an appropriate flow of information in the enterprise (*i.e.*, there are two-way channels for information exchange) and management can learn from employee experience.

- 2.g.11 An audit team should be established for each audit activity.

  - The members of an audit team should be chosen based on the needs and objectives of the audit and should, as appropriate, include representatives of various functions such as operations, maintenance, engineering, safety, health and environment.

  - The members of the audit team should have practical experience and be well-trained to identify potential hazards in the facility and record the findings. Training programmes should be designed to help auditors identify both deficiencies and good practices in the facility.

- 2.g.12 Members of the audit team should be involved in the development of audit programmes, so that they have a sense of "ownership" of the audit results.

- 2.g.13 Labour and their representatives should be included in the development of audit programmes, and in audit activities.

- 2.g.14 Industry should consider creating a system for improving the exchange of information and experience among installations within an enterprise, as well as between enterprises, in order to improve the skill of auditors. This could include, as appropriate, exchange of audit teams (or joint visits) or sharing of audit reports.

h. DECOMMISSIONING, CLOSURE AND DEMOLITION

- 2.h.1 Appropriate procedures, and organisational structures, should be developed for the safe shutdown, decommissioning and demolition of hazardous installations.

  - Such procedures should be designed to ensure that hazards are controlled during the shutdown process and while the installation is out of operation, to avoid leaving a contaminated site once the installation has been decommissioned, and to ensure that the demolition process is conducted in a safe manner and the site meets all relevant environmental and safety laws.

  - Management should ensure that contractors involved in shutdown and decommissioning follow the safety procedures.

i. OTHER INDUSTRY RESPONSIBILITIES

Product Stewardship and assistance to other enterprises

- 2.i.1 Producers of hazardous substances should promote the safe management of substances they produce throughout the total life cycle of the substances, from their design through production and use, to their final disposal or elimination, consistent with the principle of "Product Stewardship". Producers should make special efforts to help prevent accidents during the handling and use of a hazardous substance by downstream users.

  - Producers of hazardous substances have a responsibility for their products and, therefore, should create a full awareness of any potential hazards that could arise in the use, handling, storage or disposal of their products, and they should provide assistance and/or guidance, as necessary.

  - In this regard, producers should provide technology, information and assistance to their contractors, distributors, transporters, customers and users so that these can follow appropriate prevention practices. Producers should be encouraged to voluntarily provide to their customers education, training, information and other services related to risks and safe handling of chemicals.

  - Producers of hazardous substances should ensure that a complete material safety data sheet (MSDS) is prepared for each substance and is made available to all customers in appropriate language(s).

- 2.i.2 Enterprises selling hazardous substances should actively try to determine whether their customers can safely handle the substances (including, as appropriate, processing, use and disposal of the substances).

  - If this cannot be determined, judgment should 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 take appropriate action (such as assisting the customer in obtaining this capability) or else not accept such customers.

  - Suppliers and distributors of hazardous substances should be key information channels for enterprises that might need information and assistance, such as certain SMEs.

- 2.i.3 Enterprises should seek to co-operate with others in their region or within their industry sector, or to establish partnerships, to help facilitate sharing of information, and to learn from experience.

- 2.i.4 Industry/trade associations, local chambers of commerce and other industrial and professional organisations should provide a useful means of disseminating information related to prevention of accidents involving hazardous substances.

  - Industry/trade associations and professional/standards organisations should be critical sources of guidance, consultant services, and other technical tools, providing a mechanism for channelling the collective experience of their members towards the development of resources which can be made available to both members and non-members.

  - Enterprises and industry/trade associations should strongly encourage enterprises that act less responsibly to improve and meet appropriate safety objectives.

- 2.i.5 Larger enterprises and/or industry/trade associations should offer encouragement and assistance to small and medium-sized enterprises and other companies needing help, sharing their experience

and providing guidance and assistance to suppliers, customers, contractors and others with whom they have influence and/or business relationships. In this regard, larger enterprises should, for example:

- Reach out to SMEs and other companies through regional activities or indirectly through industry/trade associations and professional organisations.
- Act as "stewards" for SMEs, consistent with the Product Stewardship principles adopted by many chemical industry associations.
- Act as mentors to local SMEs (as can more experienced SMEs).
- Work with contractors to ensure that they meet safety standards whenever they are doing a job with larger enterprises and, more generally, to improve the ability of contractors to work safely, helping to establish long-term, mutually beneficial relationships.
- Provide information on chemical safety to appropriate contractors, customers and suppliers (without waiting for requests).
- Work with public authorities to help ensure sound, implementable regulations.
- Participate in industry-led voluntary safety initiatives such as the chemical industry's Responsible Care® programme.

(*See text box on Responsible Care® below*)

2.i.6 Smaller enterprises with limited resources should examine whether they need assistance on safety matters from external consultants, professional, industry or trade associations, and/or public authorities, as well as from suppliers. Suppliers of hazardous substances should be supportive by ensuring that people are available to provide advice for achieving an appropriate level of safety.

(*See para. 1.19 and the text box related to* SMEs)

RESPONSIBLE CARE® PROGRAMME OF THE CHEMICAL INDUSTRY

Responsible Care® is an initiative developed and adopted by chemical industry associations to improve the health, safety and environmental performance of their member companies' operations and products, and the level of community involvement and awareness of the industry.

Through Responsible Care®, participating companies are committed to support a continuing effort to improve the industry's responsible management of chemicals and specifically agree to:

- continually improve their health, safety and environmental performance;
- listen and respond to public concerns;
- assist each other to achieve optimum performance; and
- report their goals and progress to the public.

For further information about Responsible Care®,
see: http://www.icca-chem.org/

Transfer of technology

(*See paras.* 16.c.7 – 14 *and* 16c.23 – 41 *on international transfer of technology*)

- 2.i.7 Whenever an enterprise transfers process technology or other safety-related technology, management of that enterprise should strive to ensure that the technology will be applied in a way which will result in a level of safety equivalent to that achieved in the technology supplier's own installations using that technology.

  - Enterprises transferring process or other safety-related technology for hazardous installations have a responsibility to develop the technology and associated operating procedures so that installations can be operated to an acceptable level of safety, recognising that certain safety technology may not be appropriate in all locations and that practices of management and other employees can be significantly affected by local cultural and administrative conditions.

  - All such transfers of technology should be accompanied by related safety information.

  - The technology supplier should provide assistance to the technology receiver for education and training.

  - The technology supplier should not seek to transfer technology deemed to be unacceptable at its sites or otherwise rejected by competent authorities on grounds of safety.

- 2.i.8 Technology should not be transferred unless the supplier and recipient are satisfied, having conducted a fact-finding study and a review of an appropriate risk assessment, that the technology receiver can apply and use the technology in a safe manner, taking into account local circumstances as well as the legal and administrative infrastructure necessary for its safe operation.

  - The party responsible for carrying out this evaluation - which may differ depending upon contractual arrangements - should have access to all the necessary information and should use currently accepted techniques for the identification of hazards and evaluation of risks.

  - The responsible party should involve local authorities and community representatives, and should ensure that local authorities are given the results of the evaluation.

- 2.i.9 There should be a contract governing the transfer of the technology and this contract should, among other matters, clearly define and regulate the division of responsibilities between the parties involved with regard to effective control of operations, prevention of accidents, and emergency preparedness and response.

  - If appropriate, this contract should also have provisions relating to the procedure for the handover of a turnkey plant.

  - The sections of the contract relating to the areas described above should be available, on request, to competent public authorities and to employees and employee representatives.

- 2.i.10 When a hazardous installation involving the transfer of technology has been built to the specified design and its capability to be operated safely (in accordance with specified procedures) has been satisfactorily demonstrated in an acceptance test run, a handover document should be signed by all parties involved, including contractors.

Acquisitions and affiliated operations

(*See paras.* 16.c.15 - 41 *on international investments*)

- 2.i.11 Prior to the acquisition of, or investment in, an existing or planned hazardous installation, an enterprise should carry out a hazard evaluation to determine the nature and level of hazards at the installation. The enterprise should also determine the requirements for operating the installation in conformity with its own standards.

  - The "seller" of an existing installation should be responsible to disclose all known or suspected safety problems associated with the installation involved.

  - The "purchaser" also has a responsibility to ensure that disclosure is complete and that the necessary actions have been taken to ensure safe operation following takeover.

- 2.i.12 All relevant corporate safety policies and guidelines for accident prevention, preparedness and response should be applicable to acquisitions.

  - When an enterprise acquiring an existing installation concludes, following an assessment, that the installation does not meet the standards of the enterprise or internationally accepted safety levels, the installation should be brought up to such safety levels within a reasonable period of time.

  - In cases where retrofitting cannot be accomplished to meet these levels, the investing enterprise should, in a timely manner, inform the public authorities, employees, and employee representatives of the situation and their intended plans.

- 2.i.13 When an enterprise has an investment in, but not operational control over, another enterprise operating hazardous installations, the enterprise making the investment should consider, where appropriate, entering into contractual arrangements to assist in the establishment and maintenance of safety standards.

- 2.i.14 An enterprise should provide each of its affiliates and subsidiaries full access to all safety-related information - including newly discovered information, research results, technology, and management techniques that could reduce the likelihood of accidents or mitigate the consequences should an accident occur - at the location of the affiliate or subsidiary.

- 2.i.15 Enterprises should maintain records showing which hazardous substances are produced, used or stored at affiliates and subsidiaries, by location, on a worldwide basis in order to be able to share effectively information concerning the potential for accidents involving such hazardous substances.

- 2.i.16 An enterprise should regularly audit the safety performance and emergency response systems of all hazardous installations of subsidiaries and, to the extent possible, affiliates, to assure itself that the level of safety at such installations does not unreasonably endanger employees, neighbouring communities, the environment, or property, and is consistent with acceptable safety standards.

- 2.i.17 Financial institutions, in determining the level of funding to be provided to enterprises for investment in a hazardous installation, should take into account the amount of resources needed to comply with safety requirements as well as with corporate safety policies and guidelines.

- 2.i.18 In the event of an accident, management of an enterprise should, without undue delay, inform the management of relevant affiliates and subsidiaries of the accident, its probable causes, and recommendations for immediate safety checks. In addition, any reports prepared following the

accident (such as investigation reports) should be provided to the management of the affiliates and subsidiaries.

THE GLOBAL REPORTING INITIATIVE (GRI)

Reports on the performance of industrial operations are important for the authorities and for the public to monitor the safety and environmental situation at companies. To avoid a multiplicity of separate reports, it is becoming more common for several issues to be included in a single report. Standard reporting criteria have come into use in order to improve comparability of information and to assist in quality control.

The Global Reporting Initiative (GRI) was established as an international, multi-stakeholder initiative to develop, promote, and disseminate frameworks for voluntary reporting of the economic, environmental, and social performance of an organisation (sometimes called "sustainability reporting"). The GRI seeks to make sustainability reporting as routine and credible as financial reporting in terms of comparability, rigour, and verifiability. Each industry sector can adapt and further develop the generic framework developed by GRI. Safety performance and accidental releases are a part of the general framework of such reports, along with wastes and emissions, and human rights and labour aspects

A generally accepted framework for sustainability reporting will benefit many stakeholders. A standardised procedure encourages more companies to issue public reports. The GRI guidelines ensure better comparability between operations, and ensure that all relevant parameters are included in the measurements and audits. This is particularly important in an area such as health and safety where a variety of different reporting practices have evolved, making comparisons difficult. Systematic reporting enables comparison between companies and timeframes and can show if and where the initiatives undertaken in the field of accident prevention, preparedness and response are effective and successful.

It is also important that reports following the GRI framework will allow lay people and inspectorates to understand the commitment a company has to the environment and to safety policies, among others. Governments will use sustainability information to pinpoint and monitor areas where improvements are being made by a company, and negotiate permitting agreements accordingly. Rating agencies and investors will have information for performing sustainability benchmarking and best practice analyses.

The rapid expansion in use of the GRI framework has important implications for the way in which the Guiding Principles are applied, and how their application can be monitored.

Additional information is available at: www.globalreporting.org

Chapter 3

PUBLIC AUTHORITIES

This Chapter focuses on the roles and responsibilities of public authorities as they relate to the prevention of accidents involving hazardous substances. Specifically, it addresses the establishment of safety objectives and a control framework, as well as monitoring and enforcement. The role of public authorities with regard to other aspects of preparedness/mitigation, response and follow-up (including, e.g., provision of information to the public and land-use planning) will be addressed elsewhere in this publication.

It is important to keep in mind that the term "public authorities" as used in this publication includes the wide range of government bodies at local, regional and national level that are responsible for environmental protection, public health, occupational health and safety, civil defence, emergency response, and other aspects of chemical accident prevention, preparedness and response. This text does not specify which type of government body should be responsible for various activities since different countries allocate responsibilities in different ways in light of local laws and culture.

a. SAFETY STRATEGY AND A CONTROL FRAMEWORK

- 3.a.1 Public authorities should establish a long-term strategy for reducing the risks of accidents involving hazardous substances, and for limiting the adverse consequences of accidents that do occur. This strategy should include clear and appropriate objectives.

- 3.a.2 Public authorities should develop a clear, coherent and consistent control framework covering all aspects of prevention of accidents involving hazardous substances, and limiting the consequences of such accidents.

  - The control framework should consist of binding requirements (set out in, for example, laws and regulations). In addition, public authorities should make sure that standards, codes and guidance are developed (such as codes of practice and quality assurance guides). These materials should be designed to enable each interested party to determine whether the appropriate safety objectives are being met.

  - The control framework should also include provisions for monitoring the safety of hazardous installations during all phases of their life cycle.

  - Public authorities should endeavour to harmonise regulations among the various national and local authorities to the extent possible, and eliminate duplicative requirements.

- 3.a.3 Public authorities should promote inter-agency co-ordination. To help ensure most effective prevention, preparedness and response, and efficient use of resources, it is important that all relevant agencies co-ordinate their activities.

  - Chemical accident prevention, preparedness and response is, by nature, an inter-disciplinary activity involving authorities in different sectors and at different levels.

  - Where more than one competent public authority exists, a co-ordinating mechanism should

be established in order to minimise overlapping activities and conflicts in the implementation of requirements from various public authorities.

- Public authorities should co-ordinate among themselves to ensure that regulations, guidance and technical information provided to enterprises are complementary, not duplicative or contradictory.

- 3.a.4 In establishing safety objectives and the control framework, public authorities should consult with representatives of other relevant stakeholders.

  - Such stakeholders could include:
    - other public authorities including, as appropriate, representatives from neighbouring communities or countries;
    - industry (management and other employees);
    - professional and industry/trade associations;
    - independent experts;
    - trade unions;
    - interest groups; and
    - the public.

  - Special efforts should be made to provide the public with appropriate opportunities for input into decision-making by public authorities.

- 3.a.5 The objectives and requirements established by public authorities should be applied fairly and uniformly to ensure that enterprises of all sizes and types, whether national or foreign, are obligated to meet the same overall safety objectives. Public authorities should guarantee equal treatment for all industry, irrespective of size, establishing a "level playing field" (although the means for implementation may vary). Efforts should be made to ensure that regulations and government programmes are not biased towards larger organisations.

- 3.a.6 The control framework should allow flexibility in the methods used to meet the safety objectives and requirements. As appropriate, industry should be allowed to establish the methods that are best suited to its own particular circumstances for meeting the objectives and requirements.

  - Public authorities should consider tiering requirements in proportion to the level of risk.

  - A continuous dialogue between public authorities and industry is necessary to ensure that regulations will be applied, leading to improved safety, in particular with respect to SMEs.

- 3.a.7 The control framework should include provisions for the enforcement of requirements, and adequate resources should be available to public authorities for monitoring and enforcement activities. Enforcement mechanisms should include suitable sanctions, with penalties applicable in the event of non-compliance.

- 3.a.8 Public authorities should provide clear, easy-to-understand guidance on how regulatory objectives and requirements can be met by enterprises.

- 3.a.9 The requirements and guidance established by public authorities should stimulate innovation and promote the use of improved safety technology and safety practices.

  - The requirements should be considered the minimum; industry should be encouraged to achieve a higher level of safety than would be achieved by adherence to established standards and guidance alone.

- Public authorities should encourage industry to take measures to improve safety, for example by utilising the principles of inherently safer technology.

(*See paras. 2.c.6 – 8 related to inherently safer technology*)

3.a.10 Public authorities should recognise that their decisions or actions, although not directly involving a particular hazardous installation, can contribute to increased risk of an accident or adverse effects in the event of an accident. For example, public authorities should take into account that decisions related to land-use planning, emergency planning, emergency response, or pollution control can affect the possibility of accidents, or can aggravate the effects of accidents.

3.a.11 Public authorities should establish criteria for identifying hazardous installations considered to have the potential to cause accidents. These criteria may be based on, for example, the specific substances and/or categories of substances present in the installation and their process conditions, and their potential to cause serious harm to health, the environment or property. [10]

3.a.12 Public authorities should establish a system for obtaining information concerning certain specified categories of hazardous installations, based on established criteria (see para. 3.a.11 above). Under such a system, management of the relevant installations would be required to submit a report describing the significant hazards at the installations, and demonstrating that appropriate steps are being taken to prevent accidents and to limit the consequences should an accident occur.[11]

- Public authorities may establish different reporting requirements for different categories of installations, becoming more stringent for those installations regarded as presenting the greatest potential risk.

- The level of detail of such reports should be commensurate with the extent of hazard at the installation.

- The reports should follow harmonised formats and use agreed definitions.

- Public authorities should review the reports they receive by, for example, examining their completeness, appraising the safety of the subject installation and, as appropriate, carrying out on-site inspections to verify information in the report.

- Such reports should be publicly accessible, taking into account appropriate limitations to protect confidentiality (*e.g.*, related to trade secrets[12], personal privacy) or to protect public security or national defence. Such reports can be made available in either hard copy or electronic version. Where appropriate, a summary of the report should be prepared and made accessible to the public.

(*See paras. 2.a.16 – 18 on safety reporting by industry*)

3.a.13 Public authorities should give particular attention to ensuring that all hazardous installations, including SMEs and commercial users of hazardous substances, undertake appropriate assessments of the range of possible accidents (including low-probability, high consequence accidents) and appropriate emergency planning.

3.a.14 Public authorities should consider which installations, or modifications to installations, are so potentially hazardous that the installations should not be allowed to operate without the prior and continuing approval of an identified public authority. In these cases, a form of licensing control could be utilised, which would require management to submit full details of all relevant aspects of the installation's projected activities to the authority in advance of siting and start-up, and periodically thereafter. There should be an opportunity for public input into these licensing decisions.

- 3.a.15 Public authorities should limit paperwork/reporting requirements, focusing on those which are valuable for identifying risks and the means for dealing with them, or which are necessary for government functions. It is recognised that paperwork requirements could be a particular burden for SMEs; however, preparing reports and emergency plans is an important learning exercise and provides an important resource in the event of an emergency. Furthermore, public authorities have legitimate needs for uniform information from all hazardous installations.

- 3.a.16 Regulations and guidance should be reviewed periodically to ensure that they are consistent with the objectives of minimising risk, do not hinder improvements in design, and take into account changes in technology and experience gained.

  - Requirements and guidance should, where necessary, be amended in a timely manner to take into account technical progress, additional knowledge and international developments.

  - Amendments to the control framework that require changes in technology or management practice should allow industry reasonable time for implementation and compliance.

- 3.a.17 Public authorities should promote safety by facilitating information sharing related to safety management systems and the evaluation of such systems to determine where further work is needed.

(*See paras. 2.a.14 –15 on safety management systems*)

- 3.a.18 Public authorities should have sufficient numbers of qualified and trained staff available to carry out their roles and responsibilities in the prevention of accidents, and should ensure that staff are adequately educated and trained.

  - If the expertise necessary for public authorities to carry out their role and responsibilities is not available on staff, arrangements should be made for that expertise to be provided as needed, for example, by external consultants.

  - The contracts of external experts/consultants employed by public authorities should stipulate that the experts/consultants are not to disclose any non-public information obtained except to the public authority that has contracted their services.

- 3.a.19 Public authorities should establish a requirement that the management of hazardous installations report certain incidents (accidents and near-misses).

  - Relevant information in these reports should be made widely available to help prevent similar incidents at other hazardous installations.

  - Public authorities should also establish a system for maintaining accident statistics, for carrying out analyses of collected information, and for disseminating relevant information derived from the analyses.

- 3.a.20 In order to assist industry in improving safety at hazardous installations, public authorities should consider whether to undertake additional activities such as: providing technical assistance; promoting training programmes; encouraging research; and fostering public awareness. These activities should be conducted in a way that will not influence the impartial judgment of public authorities in their primary role of establishing and enforcing safety objectives and requirements.

- 3.a.21 Public authorities should promote assistance activities (by authorities, industry, or others) to improve safety programmes in hazardous installations of SMEs and other enterprises that might have similar limitations (e.g., in expertise, staff) for implementing such programmes. Assistance activities by

public authorities should be undertaken separately from enforcement programmes. Examples of specific actions that public authorities can take include:

- Provide mechanisms for SMEs to voice their concerns about regulations and suggest alternative approaches using, *e.g.*, ombudsmen, advisory committees and local information-sharing forums.
- Provide one-stop access to relevant information and technical assistance, *e.g.*, through information centres and toll-free telephone lines.
- Provide guidance and technical tools such as certified audit programmes.
- Promote volunteer services by enterprises (*e.g.*, to assist other enterprises in their industry or community that might need help including, for example, SMEs).
- Provide information, education and training, including feedback from experience, databases and technical papers.
- Promote voluntary safety improvement activities that go beyond regulatory requirements.

(*See para.* 1.19 *and the text box related to* SMEs)

b. LAND-USE PLANNING

The development and implementation of land-use planning arrangements (both zoning and siting) contribute to both prevention and mitigation of accidents involving hazardous substances. Land-use planning can be viewed as a preventative measure in that it can help to ensure that hazardous installations are separated by appropriate distances from other installations and developments, thereby preventing adverse effects; or it can be viewed as a means to mitigate the adverse effects of releases, fires, explosions and other accidents that occur.

Given the dual role of land-use planning, some related text is also included in Chapter 6. For a complete picture of the subject, it is important to read both sets of provisions.

While land-use planning is an essential element in the strategy for controlling risks associated with accidents involving hazardous substances, it is complementary to, but not a substitute for, other prevention and mitigation measures.

It is important to recognise that land-use planning in this context applies not only to the zoning and siting of hazardous installations, but also to significant modifications of existing installations. It also is very important to use land-use planning considerations when making decisions concerning proposals for developments in the vicinity of an existing hazardous installation (including, for example, homes, schools, shops and other commercial properties, and public infrastructure such as railroad stations).

It is noteworthy that in some countries, land-use planning is done at a national level in co-operation with local authorities, whereas in other countries it is strictly a local concern.

■ 3.b.1 Public authorities should establish land-use planning arrangements to ensure that new hazardous installations are appropriately sited, with respect to protection of health, environment, and property, in the event of an accident involving hazardous substances

- These arrangements should also prevent the placing of inappropriate *residential or other developments* near hazardous installations and should control inappropriate changes to existing installations.

- Land-use planning should address the following two elements:
  - general zoning, which includes the establishment of specific areas for hazardous industrial activities, taking into account all aspects of protecting health, the environment, and property; and
  - case-by-case decision-making concerning the siting of a specific new installation, significant changes to an existing installation, or proposed development(s) near an existing installation.

- In many areas, hazardous installations are located near residential and commercial properties or sensitive environments., These would not meet land-use planning standards for new installations or other developments (due, for example, to the fact that standards have changed over time, or the standards were not adequately enforced in the past). Public authorities should, whenever practicable, seek to get existing developments to meet the current land-use planning standards.

(*See paras. 2.c.1 – 3 related to the siting of installations*)

3.b.2 Public authorities should, when considering a proposal for new hazardous installations or development(s) near existing installations, take into account the risks of an accident posed (including adverse effects in the event of an accident). The risk assessment should be developed by, or on behalf of, the public authorities; management of the hazardous installation at issue should make necessary information available to the public authorities.

- The risk assessment should take into account the full range of implications, and the advantages and disadvantages of the particular location proposed for the new installation or development. This should be done for proposals for new hazardous installations, for significant modifications to existing installations, and for other developments in the vicinity of hazardous installations.

- Land-use planning authorities should be provided with (and take into account) technical information concerning the risk of the hazardous installation being considered (for example, from a notification provided to public authorities or from a safety report). Information should be made available by the enterprise at issue. The planning authorities should also take into account other information that may be available including, for example, reports prepared by academic institutions or NGOs.

- A systematic approach to the identification, estimation and evaluation of hazards and risks is useful for providing guidance to public authorities when they make land-use planning decisions. For example, a systematic approach could allow for a relative ranking of hazards and risks.

- In making decisions concerning land-use planning, risk assessments inform the decision-making process, but are often not the sole decisive influence. Such decisions are also a matter of socio-political judgment at the local level. In this regard, public authorities should make explicit all the criteria used to guide land-use planning decisions, including the criteria for analysing the tolerability/acceptability of risks and the decision-making process, and conclusions should be transparent.

(*See Section 2.b related to* Hazard Identification and Risk Assessment*)*

3.b.3 Land-use planning decisions by public authorities related to hazardous installations should take into account the cumulative risk to the community of all hazardous installations in the vicinity. In some cases it may be preferable from a safety perspective to centralise hazardous installations in one location, while in other cases it may be preferable to keep hazardous installations apart.

- Land-use planning decisions should take into account the possibility of a domino effect, where a chemical accident in one site could cause an accident in neighbouring site(s).

- Decisions should consider the value of keeping suitable distances between a hazardous installation and other developments in the vicinity, in order to reduce the risks of adverse effects in the event of an accident.

- Decisions should consider the value of establishing suitable distances between hazardous installations and populations and sensitive environments in order to reduce the risks of adverse effects in the event of an accident.

■ 3.b.4 The roles of public authorities, with respect to both setting safety objectives and implementing land-use planning, should be well-co-ordinated with good internal communication.

c. SAFETY PERFORMANCE REVIEW AND EVALUATION

(*See also Section 2.g on Review and Evaluation of Safety Management Performance by industry*)

■ 3.c.1 Public authorities should establish appropriate safety performance and review programmes (including inspections) for monitoring the safety of hazardous installations in all phases of their life cycle. This includes planning, siting, design, construction, operation (including maintenance) and decommissioning/closure/demolition.

- Inspections are a critical element in ensuring the overall safety of hazardous installations by checking to see whether relevant regulations, standards and practices are being met, whether safety management systems are in place and function appropriately, and whether safety reports are valid. They also provide a means for learning how to improve safety management systems, and can help to promote industry action beyond minimum requirements. Another important benefit from inspections is that they provide a basis for public confidence in the safety of hazardous installations.

- Inspection authorities should undertake different roles, as appropriate.
  - the traditional role of the inspector - ensuring compliance with all requirements - has broadened so that inspectors also play an important role in helping enterprises to identify potential problems (even if not subject to legal requirements) and in providing information about ways to improve safety performance; and
  - inspection authorities are also involved in other, related activities designed to further the general objective of improving safety, such as developing guidance for the establishment and implementation of audit programmes, providing consultation services, and facilitating voluntary self-audit programmes.

- An inspection may not be able to examine all safety-related aspects of a hazardous installation in great detail. Therefore, the focus of an inspection could be to assess the management system and, specifically, to assess whether it adequately addresses all necessary elements (in other words, to determine whether the enterprise is fulfilling its responsibilities with respect to safety).

- In some cases, inspections will include more detailed reviews. This may occur as part of an overall inspection plan (*e.g.*, where authorities establish specific priority areas from a strategy plan) or in response to poor performance at an installation or other identified concerns (*e.g.*, where the inspection reveals potential problems or where there are issues based on the authorities' review of the safety report).

- Inspections are a key element, but only one part of the control system of public authorities. Others elements include, for example, permitting, documentation, and reviews.

■ 3.c.2 Public authorities should ensure that guidance is prepared for those with compliance obligations on how they can best meet their obligations and satisfy the monitoring/enforcement authorities.

- 3.c.3 For monitoring to be effective and credible, the authorities responsible for inspections and related monitoring activities should be publicly accountable. This can be achieved by making the system transparent.

  - To this end, the authorities responsible for inspections and related monitoring activities should publicise the objectives, policies, and procedures they follow in monitoring activities.

  - In addition, public authorities should make publicly available the outcomes of their monitoring activities.

  - This can help establish and maintain trust among stakeholders (public authorities, industry, employees, the public and others).

  - Public authorities (and industry) should make a concerted effort to make available to the public relevant information in a form that can be readily understood and to provide opportunities for dialogues among stakeholders (industry, public authorities, and the public).

  - There is also a need to assist the public to better understand the nature of "risk" and the risks posed by hazardous installations.

- 3.c.4 All inspection programmes should have some common elements (which are critical to the success of all audit and inspection programmes). Specifically they each should have:
  - clearly defined goals;
  - an identified scope, recognising that if it is too broad then it may be difficult to achieve the desired objective;
  - a schedule (including, *e.g.*, a plan of action with time frames);
  - appropriate expert(s) who are trained and qualified for the specific tasks and goals;
  - reviews of appropriate documentation, as well as interviews with key personnel (including process operators);
  - an identification of deficiencies and proper practices;
  - a formal report of findings;
  - a management review to clearly define responsibilities for follow-up actions and a means for ensuring that the actions are carried out; and
  - a demonstration that the follow-up actions have been carried out.

- 3.c.5 The involvement of public authorities in monitoring activities, including inspections, does not diminish the fact that the primary responsibility for the safety of hazardous installations rests with the management.

- 3.c.6 Public authorities should share information and experience, within countries and internationally, concerning methodologies and tools related to inspections, and also share the outcome of specific inspections. Efforts should be made to promote such activities on an ongoing basis, and develop mechanisms that could be used to facilitate information sharing.

  - In order to share experience among inspectors, further efforts should be made to promote "mutual joint visits" of inspections.

  - In addition, there should be established international networks of inspectors for various aspects of chemical safety.

  - One way to improve learning from the experience of others is to increase harmonisation of laws and consistency of approaches related to monitoring and inspections.

  - The approaches used for inspections should be appropriate to local laws and culture and, therefore, it may not be possible to achieve uniformity in approaches.

- 3.c.7 Efforts should be made to use more leading performance indicators as one way to measure safety and determine whether actions being taken are actually leading to reduced risk. Furthermore, such indicators could help focus audits and inspections on areas of highest priority.[13]

- 3.c.8 Public authorities should establish programmes for inspections on an annual (or multi-year) basis, setting goals and priorities - *e.g.*, to focus during one year on a particular subject such as multi-operator sites - and setting out timetables.

  - In setting goals and priorities, authorities should take into account past performance of hazardous installations with respect to safety, as well as the nature and the extent of hazards involved in the installations.

  - Normally, the inspection programmes would include provision for scheduled inspections, as well as unscheduled "spot checks", as appropriate (*e.g.*, where there is an area of concern). Both scheduled inspections and spot checks have an important function.

  - An important benefit of setting out inspection plans well in advance is that it provides the opportunity for authorities to train and equip their inspectors to effectively carry out the inspections.

- 3.c.9 Public authorities should develop a consistent, standardised approach to planning, executing, and reporting of inspections. This will allow improved understanding of trends over time and facilitate exchange of information and experience.

  - All inspections should include documentation of the results, including recommendations for follow-up action and any enforcement action needed.

  - The follow-up actions should be designed to ensure that identified shortcomings are addressed in an appropriate and timely fashion, and that there is verification of actions taken.

  - There are a number of different tools available to public authorities for follow-up action, depending on the severity of the concerns including, for example: notifications of changes to be made; identification of agreed actions and timetables; citations and fines; and, in the most severe cases, shutdown of facilities.

- 3.c.10 Inspections should be carried out by an inspector or inspectors supported by experts, as needed, to address the specific hazards of the installation.

  - Third parties (independent of government and the enterprise) can be delegated to undertake technical or systems inspections on behalf of public authorities. Efforts should be made to ensure the quality of such third parties (for example, through certification or accreditation schemes).

  - Even when third parties are involved, public authorities retain their legal responsibilities for the inspections; they cannot delegate their responsibilities to the third-party inspectors.

  - Where third parties are involved, care should be taken to avoid the potential for conflicts, in particular where such third parties engage in both consulting and inspection services.

- 3.c.11 Public authorities should be given sufficient resources and personnel to carry out their inspection function. Inspectors working for public authorities should receive the training and have the necessary expertise to determine, for example, whether the approaches taken in a hazardous installation will achieve legal requirements.

- 3.c.12 Public authorities involved with chemical accident prevention, preparedness and response (*e.g.*, those responsible for health, safety, environment, civil protection, at national, regional and local

levels) should co-operate and co-ordinate in the area of inspections. This will help to maximise efficiency and minimise duplication of effort (especially given limited resources) and effectively contribute to the management of risk. Such co-operation should address the various phases of the inspection process, as appropriate (*e.g.*, preparation, on-site inspection, report and follow-up).

- Co-operation provides a number of related benefits, including an opportunity to: learn from each other; share resources, expertise and tools; benefit from different perspectives; minimise the likelihood of different authorities giving conflicting advice or reaching conflicting conclusions; facilitate improvements of regulations/standards; aid in conflict resolution (*e.g.*, between safety and environment); and improve understanding and trust between authorities. Thus, co-operation should lead to greater consistency in approaches and results between inspection teams within a country.

- The industry also benefits from such co-operation. For example, co-operation could result in more targeted inspections, avoidance of duplication, and consistency in approach by the various concerned authorities. This should lead to fewer interruptions in business activities and allow employees to more effectively participate in inspections.

- Effective co-ordination of inspections among the various concerned authorities requires hard work in order to establish mutual understanding of the different cultures, laws, and structures of the authorities.

- As part of the steps necessary for effective co-ordination, authorities should establish:
  - procedures for joint inspections, as appropriate;
  - a clear division of tasks, with identification of roles and responsibilities for various aspects of the inspections;
  - mutual understanding among the authorities of all relevant aspects of the authorities' culture, including their legal instruments, policies, and procedures;
  - co-ordinated training activities;
  - clear lines of communication; and
  - an identified mechanism for dealing with conflicts.

- A co-ordinated inspection does not imply that the inspection is fully integrated. Rather, the objective should be to avoid duplication of effort and to share the burden of the aspects of the inspections where there is a shared interest.

3.c.13 Inspectors (public authorities) and the regulated industry should co-operate in the conduct of audits and inspections. Such co-operation can take different forms, including improved co-ordination of activities and communication about areas of mutual interest and openness in discussing the results of audits, and time schedules. In addition, co-operation can also help authorities build on the results of audits by the enterprise or third parties.

- A good system of regulations provides a necessary foundation for co-operation, and for trust, between industry and public authorities. The regulations provide the leverage needed to ensure that the public authorities can protect the interests of the public and employees.

- Co-operation generally leads to a number of improvements including, for example:
  - an increase in the efficiency of inspections, thereby allowing public authorities, industry and others to make best use of limited resources (including manpower);
  - a basis for the authorities to decrease the frequency, or change the nature of, inspections based on information provided to authorities;
  - improving the ability of the parties to learn from each other, with the result that they are better able to carry out their roles and responsibilities (*e.g.*, the audit process can be improved based on the advice of the inspecting authority); and

- increasing the level of trust and involvement among stakeholders (including employees and the public).

⏩ In undertaking to co-operate with industry, public authorities should ensure that this co-operation does not influence their ability to enforce the laws, nor should they be seen as having diminished their independence through such co-operation.

⏩ In order for co-operation to be successful, management of hazardous installations should be competent and willing to address safety issues in a serious way. In addition, they should be willing to share the outcomes of audits with the authorities.

3.c.14 Public authorities should consider co-ordination of various aspects of safety, health and environment where doing so would result in clear benefits. This would parallel the efforts of the chemical and other industry sectors to improve the integration of the management of safety, health and environmental issues in order to address these in a more efficient and effective way.

Chapter 4

PUBLIC AND OTHER STAKEHOLDERS

This Chapter addresses the roles and responsibilities of various stakeholders, other than industry and public authorities. It focuses on communities/public, labour organisations, research/academic institutions, and non-governmental organisations.

a. COMMUNITIES/PUBLIC

(*See text box following Section 4.a, relating to "Example of Community Representation"*)

- 4.a.1 Members of communities in the vicinity of hazardous installations, and others who are potentially affected in the event of an accident, should be aware of the risks of accidents, know where to obtain information concerning the installations, and understand what to do in the event of an accident.

  - Public awareness is likely to lead to a reduction in the number and severity of chemical accidents. For example, an informed public can provide an incentive for industry to reduce the risks of chemical accidents. In addition, an informed public can provide a stimulus for dialogue among industry, public authorities and the public, and a basis for effective participation of the public in decision-making related to hazardous installations.

  - To the extent the public is informed about risks in their community, they are more likely to participate in decision-making processes and to take steps to help reduce the risks.

(*See Chapter 7 related to Communication with the Public, focusing on Emergency Preparedness/Mitigation*)

- 4.a.2 Communities in the vicinity of hazardous installations should, where appropriate, have representatives who can serve as a link between the community and other stakeholders, and facilitate exchange of information.

  - Such representatives could, for example, be chosen through local governments or could volunteer on their own initiative.

  - Community representatives can be seen as a partner to the other stakeholders, helping to make known the views and concerns of the community and providing a means for the installations to work with members of the community.

  - The existence of community representatives does not change, or limit, the roles and responsibilities of industry or public authorities.

- 4.a.3 Community representatives can help other stakeholders to inform and educate the public and can help channel feedback from the community to the installations and public authorities.

  - Community representatives should actively seek information concerning hazardous installations. These representatives should also be identified to hazardous installations and public authorities, so that information can be provided.

- Community representatives should co-operate with public authorities and, as appropriate, with representatives of hazardous installations in order to help develop communication programmes and messages. Involvement of community representatives can help ensure that information on hazards is disseminated, is understood by target audiences, and is well-received.

- Community representatives should, where feasible, disseminate information they have acquired. This could be done by different means, such as newspapers, website, bulletin board postings, *etc*.

EXAMPLE OF COMMUNITY REPRESENTATION: HOW TO ESTABLISH A CITIZEN COMMITTEE TO ADDRESS CHEMICAL ACCIDENT PREVENTION, PREPAREDNESS AND RESPONSE

One way to involve members of the community more, and facilitate exchange between local residents and other stakeholders, is to create a committee with members representing the varied interests of the community. Although it is not exhaustive, the following highlights a number of issues to consider in order to create a functional and representative committee

The membership of the committee is important, as the committee should reflect the interests of the community. The members should come from different areas of the community, as well as from different backgrounds. As applied in the US and Canada, the committees generally include representatives of local industry, municipal authorities, non-governmental organisations, and employees of nearby installations, as well as educators, community activists and unaffiliated citizens.

To facilitate the start-up of the committee, an external and neutral consultant could be hired. The hazardous installations could help the process by identifying target groups within the community and inviting them to participate.

In order to get effective participation from local citizens, the committee might try to attract individuals with relevant skills. One way to do this is to include retirees (*e.g.*, retired lawyer, engineer, environmental specialist, *etc*.).

Normally, the members of the community who participate in the committee do so on a voluntary basis. Given this, it is important to facilitate participation (*e.g.*, by holding meetings at convenient times and locations) and to find ways to express appreciation for the efforts of participants. In addition, the atmosphere should reflect a sense of shared purpose, and be friendly and relaxed where people can learn to work together. This will facilitate communication and help to develop a high level of trust between stakeholders.

The committee should establish its mandate and its objectives (in consultation with relevant stakeholders), and identify its own activities to attain these objectives. This should be done taking into account local circumstances, and the abilities of committee members. Consideration should be given to having a neutral mediator (paid or not) to facilitate meetings of the committee.

The management of hazardous installations and representatives of public authorities should treat the members of the committee as partners. Paternalistic behaviour from representatives of local enterprises or public authorities could harm the relationship and degrade the exchanges between stakeholders.

Financing should be provided to the committee to ensure its viability. However, to keep the independence of the committee, this financing should only cover the expenses of the committee. The financing could come from various sources including, for example, the management of hazardous installation(s), trade/industry associations, and public authorities.

A network for exchanging information and for communication should be developed within each committee. In addition, means should be developed to allow different committees to share experiences.

b. LABOUR ORGANISATIONS

- 4.b.1 Labour organisations should support safety training and education of their members.

  - This support could take the form of direct training of individuals, or by facilitating the training activities of others through, for example, the development of a syllabus, provision of training materials and programmes, supplying tutors and speakers, and assisting with the sharing of experience related to training.

  - The experience and understanding gained by labour organisations from their training and education programmes, and from their practical day-to-day experience, can be used to help improve prevention policies and activities. As trade unions have a direct interest in the successful future of the enterprises in which their members work, they can be valuable allies in the achievement of high levels of safety.

  - Labour organisations also help to train Safety Representatives. Safety Representatives are responsible for dealing with the health and safety interests of fellow employees. They also play important roles with respect to mediation and communication between management and other employees.

(See para. 2.d.28 related to Safety Representatives)

- 4.b.2 Labour organisations should facilitate co-operation with management at national and international levels.

- 4.b.3 Labour organisations should participate in international organisations that develop guidance on chemical safety and accident prevention. For example, as one of the tripartite constituent groups of the ILO, labour organisations have had, and continue to have, a leading role in the development and promotion of ILO Conventions and Recommendations.

c. RESEARCH/ACADEMIC INSTITUTIONS

(See text box below, at the end of this Chapter)

d. INTERNATIONAL ORGANISATIONS

(See text box in section 16.b on the role of intergovernmental organisations; see also text boxes on APELL *in sections 5.d and 16.b.)*

e. NON-GOVERNMENTAL ORGANISATIONS (NGOs)

- 4.e.1 NGOs (such as environmental, humanitarian and consumer groups) should motivate their constituents, and others, to be involved in risk reduction and accident prevention efforts. They should help to identify specific concerns and priorities regarding risk reduction and prevention, preparedness and response activities.

- 4.e.2 NGOs should facilitate efforts to inform the public, and should provide technical assistance to help the public analyse and understand information that is made available.

- 4.e.3 NGOs should have the opportunity to contribute to decision-making processes related to hazardous installations, as appropriate, including, for example, those related to licensing and land-use

planning. Members of NGOs could have the skills and experience which allow them to review technical information, legal documents and other materials needed for effective participation and for recommending possible solutions to identified concerns.

- 4.e.4 NGOs should participate, where appropriate, in legislative and regulatory processes by, for example, helping to identify public concerns that might effect policy objectives, providing analyses of information from a range of installations (*e.g.*, concerning incident case histories), suggesting new policy directives, and facilitating learning from the experiences of other countries or regions.

RESEARCH/ACADEMIC INSTITUTIONS

Research and academic institutions should be motivated to undertake research related to chemical accident prevention, preparedness and response.

Subjects identified as useful for further research in this area include:

- improving risk assessment techniques, and assessments of chemical accidents and response capabilities through better equipment and practices;
- improving understanding of the effects on health and the environment from acute exposures to different hazardous substances*;
- improving medical treatment and decontamination procedures; and
- improving understanding of risk acceptability/tolerability.

Organisations involved in research related to accident prevention, preparedness and response should co-operate and share the results of their research in order to help establish confidence in research results and avoid unnecessary duplication of effort. Co-operation can be facilitated through multi-member, shared-cost research projects and information networks, as well as through exchange of information at meetings and through written materials.

In order for safety-related research to be shared as widely as possible, the results should be available in a format and language that can be widely understood by potential users.

Furthermore, national and international inventories of research activities should be established to facilitate the dissemination of research information and results.

In a related matter, it is recommended that the curriculum and research programmes of science and engineering departments of universities and colleges should include, as an integrated element, risk analysis and other safety aspects of design, operation and management of hazardous installations and the transport of hazardous substances. This subject will be further elaborated at an OECD Workshop scheduled for 2003.

Also, courses on emergency planning, safety and risk analysis should be part of extension and continuing education programmes.

Furthermore, research organisations should establish links with industry to develop relevant research topics for graduate students

* Work related to health effects is underway through several national and international projects, such as the US-based Acute Exposure Guideline Levels (AEGLs) project and the EC ACUTEX project to develop innovative approaches to define acute exposure levels that could be used to develop acute exposure levels for emergency planning and land-use planning.

NOTES

1. Different countries and enterprises may have different types of representatives of employees, including union representatives or Safety Representatives.

2. For purpose of this publiction, incidents are defined for this publication as accidents and/or near-misses.

3. For purpose of this publiction, employee is defined in Annex I to include *both management and labour, as well as (sub)contractors*.

4. Such reports are known in some countries as "safety reports" or "risk management plans".

5. These steps can be described using different terminology. For example, in CARAT (the Web-based system developed by the OECD to facilitate communication concerning risk assessment), the general elements are described as: hazard identification; release exposure analysis; dose response; and risk expression (followed by risk integration). For further information on CARAT, see the footnote associated with para. 2.b.9.

6. In response to concerns that a lack of consistency in the definitions of key terms creates an impediment to sharing experience related to risk assessments, the OECD established a Web-based system called "CARAT" (Chemical Accident Risk Assessment Thesaurus). CARAT is intended to facilitate communication concerning chemical accident risk assessment among, and within, countries, helping to overcome problems resulting from different cultures and languages. CARAT is a system that captures, in a database, information on different approaches to risk assessment-related laws, regulations, guidance documents, case studies, and terminology. The CARAT system is based on the premise that the risk assessment process consists of various steps that can be described in objective, operational language. The operational language leads to transparency and provides a basis for comparison among different approaches. Users can search the CARAT database via the Internet to view an individual entry, to compare two or more entries, and to perform a variety of user-specified searches. The website address of the CARAT[SM] is: www.oecd.org/ehs/carat

7. The terms "inherent safety" or "inherently safer" when used in connection with hazardous installations should not be read to imply that there is no residual risk. It is important that these terms are used carefully and that the risks posed by the facility are properly understood and communicated.

8. Domino effects occur when an accident causes greater adverse effects or triggers further accidents as a consequence of the proximity of other parts of the installation or nearby installations and their inventories of hazardous substances.

9. OECD is publishing, in 2003, guidance on the development and application of safety performance indicators for public authorities, industry and the community.

10. See, for example, the relevant annexes of the Seveso II Directive and of the UN/ECE Convention on the Transboundary Effects of Industrial Accidents.

11. Such reports are known in some countries as "safety reports" or "risk management plans."

12. Under no circumstances should information critical to safety be considered a trade secret.

13. In 2003, OECD is publishing guidance on the development and application of safety performance indicators for public authorities, industry and the community.

Part B

EMERGENCY PREPAREDNESS/MITIGATION

This Part deals with the roles and responsibilities of the various stakeholders with respect to emergency planning (sometimes called preparedness planning) and mitigation of accidents (including land-use planning and communication with the public).

As described below, industry has the primary responsibility for on-site planning, and public authorities have primary responsibility for off-site planning. However, to be effective, the emergency planning process requires co-operation among the various stakeholders including, for example, response personnel, health/medical personnel, representatives of the public and the media.

For purposes of this publication, health/medical personnel includes both organisations and individuals with responsibilities related to public health.

Chapter 5

EMERGENCY PREPAREDNESS AND PLANNING

a. GENERAL PRINCIPLES

This Section applies to both on-site and off-site emergency planning.

- 5.a.1 Public authorities (at all levels) and management of hazardous installations should establish emergency planning activities/programmes for accidents involving hazardous substances.

  - The objective of emergency planning activities/programmes should be to put into place the arrangements needed to localise any accidents that may occur and, if possible, contain them and thereby minimise their harmful effects on health, the environment, and property.

  - A prerequisite for effective emergency planning is the identification of the hazardous installations located within the area to be covered by the emergency plan.

  - On-site and off-site emergency plans should be prepared, that include details of appropriate technical and organisational procedures that are appropriate to minimise the effects on health, environment and property (both on-site and off-site) in the event of an accident.

  - Other risks, such as the risks of transport accidents involving hazardous substances and natural disasters, should be taken into consideration in emergency planning for hazardous installations.

- 5.a.2 As part of the emergency planning process, there should be an elaboration of possible scenarios, and an identification of the potential risks and the geographical zones where effects are likely to occur in the event of an accident. The zones should indicate, *inter alia*, the public potentially affected and those areas for which decisions concerning evacuation, sheltering in place, or other actions to limit exposure may have to be taken. The identification of such zones should also provide an indication of the nature and extent of resources that may be needed in the event of an accident.

  - The identification of zones where exposures are likely to occur should take into account the possibility that adverse effects could result from: direct contact with toxic or irritating substances (for example, through eye exposure, skin contact or inhalation); thermal radiation or overpressure; indirect exposure (for example, through ingestion of contaminated food or water); or indirect injuries (for example, from collapsing structures, projectiles or fire).[1]

  - The identification of zones where effects are likely to occur should indicate the existence of critical infrastructures (including transport facilities and roads), environmentally sensitive areas, and developments with sensitive populations (such as hospitals, nursing/retirement homes, shopping malls, schools or other areas where children congregate). In the case of developments with sensitive populations, it may be necessary to make direct contact, with specific instructions, in the event of an accident.

- The emergency planning process should take into account the identification of such zones. The identification of possible impacts should be made on the assumption of worst-case and most probable accident scenarios.

- At the time of an accident, the areas at actual risk will need to be determined based on the nature of the hazardous substance(s) released, the weather conditions/prevailing winds, and likely dispersion of the substances into the environment.

■ 5.a.3 The emergency planning process should include the assessment of potential environmental consequences of accidents, as well as potential health consequences, and should identify appropriate prevention, preparedness and response actions.

- Emergency planning should aim to avoid pollution of environmental media, such as surface and underground water sources and soil, in the event of an accident at hazardous installations.

- In addition environmental impact assessments prepared for proposed developments should take into account the possibility of chemical accidents, as appropriate.

(See Section 2.b on Hazard Identification and Risk Assessment)

■ 5.a.4 Emergency planning should take into account potential complicating factors that could be associated with accidents at hazardous installations, as well as factors that may make response more difficult. These include, for example, extreme weather conditions, natural disasters, loss of power or water supplies, problems with communication and transportation systems, synergistic effects of accidents with multiple substances, "domino effects", and sabotage.

■ 5.a.5 All parties who will be involved in an emergency response effort (*e.g.*, fire, police) should be involved in the emergency planning process.

- In this respect, public health authorities, including experts from information centre(s), should be involved in relevant aspects of both on-site and off-site emergency planning.

- There should be opportunities for representatives of the public to provide input into the emergency planning process.

- Representatives of the media should also be involved during development of emergency plans.

(See Part C on Emergency Response)

■ 5.a.6 The off-site emergency plan and all relevant on-site emergency plans should be consistent and integrated.

- This is critical in order that:
  - there is effective co-ordination;
  - problems with overlapping responsibilities and complicated interfaces are resolved; and
  - it is clear who has the responsibility for various emergency response functions in the event of an accident involving hazardous substances which may have off-site effects.

- There should be close co-operation between those responsible for off-site and on-site emergency planning.

■ 5.a.7 Public authorities and industry should co-operate on emergency planning to protect population centres in the area of hazardous installations, as well sensitive environments.

- Emergency plans should provide guidance on when the potentially affected public should shelter indoors and when they should be evacuated.

- Emergency planning should take into account the special situation of local institutions that may have particularly sensitive populations and critical infrastructures, such as schools, hospitals, homes for the elderly, and prisons.

■ 5.a.8 Good co-operation between industry and response personnel (*e.g.*, fire service, police, rescue operations, health services) is essential for effective preparedness and response.

- In this regard, those involved need to be able to communicate effectively (*i.e.*, they need to "speak the same language").

- Industry and authorities responsible for response services should exchange knowledge and experience related to all aspects of prevention, preparedness and response.

■ 5.a.9 Industry, public authorities and health/medical organisations should co-operate in order to ensure that health/medical personnel - who may be involved in an emergency response involving hazardous substances - are acquainted with the hazardous substances that are produced, used, transported or otherwise handled in significant quantities in their community. Health/medical personnel should also be aware of relevant aspects of local emergency plans, and of their roles within these plans.

(*See paras. 5.c.11 – 19 related to health/medical aspects of emergency planning*)

■ 5.a.10 Emergency plans (on-site and off-site) should identify the roles and responsibilities of all the parties concerned and should indicate the chain of command, the lines of communication, the co-ordination among parties, and the means for obtaining necessary information, resources and equipment.

■ 5.a.11 Emergency plans should provide the necessary guidance to allow for flexible response to a range of possible situations (from small accidents to worst-case scenarios).

- An emergency plan cannot provide prescriptive instructions for response, since each accident by its nature will be different and will often involve a combination of aspects that may not have been considered during the planning process.

- Among the reasons why emergency plans, although theoretically sound, fail in their application include: not taking account of the lack of information available at the time of the accident; insufficient training; insufficient co-ordination; breakdowns in communication; failure to recognise limitations of individuals in stressful situations; and a plan that is too complex or places too many demands on certain individuals.

■ 5.a.12 On-site and off-site emergency plans should be tested and reviewed regularly, updated as appropriate, and maintained up-to-date taking into account, for example, changes in the nature of the risks, new residential and commercial developments in the area, improvements in response technology and capabilities, lessons learned from exercises/tests and from application of plans during accidents and near-misses, and changes in personnel.

- Testing of emergency plans at appropriate intervals is critical for ensuring that they are adequate, complete and realistic, and that the various plans applicable in an area (on and off-site) are compatible. Testing also provides a means to identify gaps or needs with respect to the availability of appropriate personnel (including training needs), equipment, supplies and information. In addition, testing increases the confidence of response personnel in being able to deal with real emergencies.

- Exercises can test separately different components of a plan and can include simulations through, for example, table-top computer exercises.

- There is a need to determine an appropriate testing regime, and which aspects should be tested at a given time (since not all aspects of a plan will be subjected to each test). For example, priority may be given to testing areas that are suspect or have not been tested for some time.

- Some exercises should be undertaken in adverse conditions (for example, outside normal working hours, during inclement weather, *etc.*) to reveal the range of limitations and problems inherent in the emergency plans.

- The individuals who will be involved in the event of an accident should be involved in the tests/exercises. For example, since response to an accident would require decision-making by high-level officials (from industry and from public authorities), those officials should be involved in relevant tests. In addition, members of the public should be involved in appropriate parts of the tests/exercises.

- If the activity involved in an exercise/test might raise questions or concerns on the part of the public, they should be told about the exercise/test in advance.

- Maximum benefit is gained from conducting exercises/tests in a "no blame environment" (*i.e.*, no blame is assigned for errors or problems identified). In such a case, all participants can feel free to be open and honest in their evaluations without fear of repercussions.

- The use of independent observers during exercises facilitates an objective review of any deficiencies or defects in the emergency plans.

- For testing off-site plans, consideration should be given to combined testing of plans for a given area (*i.e.*, where there is more than one hazardous installation in the area, or where an accident may affect more than one community within a country or across the border). This is more cost-efficient and can provide improved insights into limitations in the planning.

- Tests should also take into account transport of hazardous substances under the responsibility of hazardous installations.

- The results of exercises/tests of emergency plans, and any revised emergency plans, should be published and made widely available to inform all those who may have a role to play in the event of an accident, and to provide a means to allow others to learn from the experience.

■ 5.a.13 During the emergency planning process, there should be a realistic assessment of the existing skills, equipment, and other resources that are available for a response effort, and an assessment of the skills, equipment, and other resources required based on the range of possible accident scenarios, including worst-case scenarios. These assessments will provide insight into what additional skills, equipment, and resources are needed.

■ 5.a.14 All responsible parties should ensure that human resources, equipment (including communication equipment and personal protective equipment), and financial and other resources necessary to carry out emergency plans are readily available for immediate activation in the event, or imminent threat, of an accident. Where necessary, expensive or specialised equipment should be obtained through co-operation with other communities, or public authorities at other levels, or through co-operation with private enterprises.

- Mechanisms should be established for assistance, from neighbouring or other relevant communities within the country or across borders (mutual aid), in the event an accident exceeds local response capability.

- Public authorities in neighbouring communities (within a country or across borders) should pool resources (including equipment, expertise, health-related resources and information) in order to make the best use of response capabilities. Efforts should be made to ensure compatibility of equipment and other relevant resources that are made available for sharing with other communities (*e.g.*, hose fittings).

- It is important for communities to maintain an adequate level of response capacity, and retain a level of response resources commensurate with local risks, before providing resources to other communities as part of a mutual aid effort.

- Efforts should be made to ensure that there is an adequate response capacity throughout a country so that a reasonable level of resources is available in every area, relative to the level of risks, taking into account both public and private resources. In certain areas it may be necessary for enterprises to provide equipment and resources to respond to accidents originating at their installations to compensate for the lack of resources available to local authorities.

(*See Section 16.a related to Transboundary Co-operation*)

5.a.15 Information, supplies and equipment needed to help response personnel to assess the accident and decide on appropriate response actions should be readily available.

- This would include, for example, analytical methods and equipment for detecting hazardous substances and for taking protective measures in the event of loss of containment, and information on first aid measures and related antidotes for specific chemicals.

- Technical information in emergency plans (*e.g.*, concerning the physio-chemical properties of substances) should be presented in a form appropriate for emergency responders and should provide clear guidance on actions to be taken.

- Information on potential adverse impacts of accidents - based on both pre-planned scenarios and dispersion models - should be available to responders in real time in order to facilitate rapid response.

- Clear safety-related information should be available on site at every hazardous installation. Such information includes, for example, information on what to do in the event of an accident, how to minimise adverse effects to health, environment and property, and first aid measures to treat those who have been exposed.

- All efforts should be made to address the problem of hazardous substances for which there has been limited assessment (and therefore limited information on how to respond in the event of an accident). In addition, such substances should be made a priority for research to improve knowledge of possible effects to health and the environment, as well as treatment methods.

5.a.16 Back-up systems should be built into emergency plans. For example, alternative communication lines should be available, relief for key personnel should be assigned, and an alternative command centre should be designated in the event that the primary centre cannot function properly.

5.a.17 Systems and procedures should be in place for the rapid detection of an accident or imminent threat of an accident, and for the immediate notification of emergency response personnel.

- 5.a.18 The emergency planning process should include an elaboration of the methods to be used to inform the public of what to do in the event of an emergency, and how the public will be informed when an accident occurs.

  - Emergency warning alert systems should be in place to warn the potentially affected public when an accident occurs, or there is an imminent threat of an accident.

  - The system chosen should be effective and provide timely warnings. Suitable warning systems could include one or a combination of, for example, sirens, automatic telephone messages, and mobile public address systems.

  - The potentially affected public should be notified of the systems which will be used to warn them in the event of an emergency, and the systems should be tested in advance so that their significance is fully understood by the public and the public know how to respond appropriately in an emergency.

(*See Chapter 7 on Communication with the Public*)

- 5.a.19 Spokespeople designated for emergency situations should be carefully chosen during the planning process so that they have the necessary knowledge, skills, authority and credibility to effectively communicate with the public.

  - Spokespeople should be specifically selected and trained so that they understand how to develop information for target audiences and how to deliver information effectively.

  - Since effective communication with the public during an emergency requires the co-ordinated involvement of a number of relevant parties - including, for example, local response officials, corporate spokespeople, employee representatives, community representatives, public authorities, technical experts and the media - the duties of these parties should be established during the preparation of emergency plans.

(*See para. 7.13 related to the role of the media*)

- 5.a.20 Public authorities, industry and other stakeholders should be involved in multinational and regional co-operative activities related to emergency planning, where appropriate, in order to share experience, improve planning and facilitate appropriate co-ordination of emergency response in the event of an accident.

b. INDUSTRY

- 5.b.1 All hazardous installations should have an adequate on-site emergency plan, which is appropriate for that installation and is based on a complete range of accident scenarios, including most probable releases and worst-case scenarios.

  - To form the basis for emergency planning (both off-site and on-site), the management of all hazardous installations - including SMEs and enterprises that are not considered part of the chemical industry but use or handle hazardous substances - should identify and assess the full range of accidents that could arise at the installations (including low-probability, high-consequence accidents), and the appropriate response actions. This information should be available in "safety reports" or related reports, where such reports have been prepared.

(*See paras. 2.a.16 – 18 related to safety reporting*)

- An on-site emergency plan should contain a scale plan of the site together with a list of all hazardous substances handled, indicating the quantities involved, and their locations on the site relative to the surrounding area and population. The plan should also contain an evaluation of the hazards involved and include information regarding each hazardous substance, the conditions under which it is processed, handled and stored, and first aid needs in the event employees or the public are exposed to a hazardous substance.

- On-site emergency plans should also provide for the orderly and phased shutdown of an installation, when necessary.

- The preparation of the on-site plan should be the responsibility of management, financed by the enterprise. Implementation of the plan should be the responsibility of management in co-operation with other employees.

- The on-site plans should be available for review by public authorities.

- Any hazardous installation that does not have the resources to undertake emergency planning, based on a full-range of accidents that could arise at the installation, should seek assistance to meet this obligation (from, for example, neighbouring installations, suppliers, or public authorities).

■ 5.b.2 On-site emergency plans should identify the roles and responsibilities of all parties concerned, and should clearly indicate: the chain of command and co-ordination among the parties; lines of communication; and the means of obtaining necessary information.

- As part of the on-site emergency plan, individuals should be nominated for the following roles, among others:
  - on-site (enterprise) co-ordinators to take control on scene in the event of an emergency;
  - on-site main controllers from the emergency control centre of the enterprise to take overall control of an emergency and to communicate with public authorities; and
  - person responsible for initiating activation of the off-site plan.

- The role of the on-site co-ordinator and site main controller in relation to community emergency response personnel should be clearly spelled out in order to avoid any potential conflicts. In this regard, the on-site co-ordinator and controller may be subject to decisions made by the accident (on-scene) co-ordinator of the public authorities.

- In establishing the responsibilities for various employees[2] in the event of an accident, the on-site emergency plan should be flexible so as to be applicable to all foreseeable variations in staffing and should take account of such matters as absences due to sickness, holidays and periods of installation shutdown.

■ 5.b.3 All employees at a hazardous installation should be made fully aware of the relevant provisions of the on-site emergency plan. In particular, they should be made aware of what to do in the event of an emergency, such as taking action to limit the release of hazardous substances and/or evacuating the installation and gathering at a previously designated assembly point.

- All employees should be informed of the procedures for raising the alarm in the event of an accident or threat of an accident to ensure that earliest possible action is taken to control an incident.

- On-site managers should ensure that appropriate employees are familiar with the capabilities and response plans of the fire authorities and other emergency responders.

■ 5.b.4 Visitors to a hazardous installation should be provided with relevant information concerning what they should do in the event of an emergency.

- 5.b.5 Communicating information to the public on plant safety, safety measures and the characteristics of substances should not be hampered by claims of trade secrets by industry. As a general rule, multinational enterprises should not claim trade secret protection in one country for types of information they release in another country. Any exceptions to this rule should be justified on a case-by-case basis.

- 5.b.6 Management of hazardous installations should ensure that sufficient quantities of appropriate emergency medical supplies (including suitable antidotes), kept updated, are easily accessible locally. This is particularly important in areas where maintaining such supplies is difficult for local health authorities.

- 5.b.7 The activities related to emergency preparedness and those related to prevention of chemical accidents should be integrated with the normal operation of a hazardous installation so that the organisational structures for these activities are compatible.

- 5.b.8 Management should work with public authorities in the development of off-site plans to ensure that the people responsible for the preparation of off-site plans have all necessary information for their plans, including information needed to assess hazards and to help ensure the compatibility of off-site and on-site plans.

    - As part of the emergency planning process, management should co-operate with emergency responders to consider response options to various accident scenarios and to agree on appropriate options for different scenarios.

    - For emergency preparedness, response and follow-up purposes, management should make available health-related information concerning the hazardous substances(s) it manufactures and/or distributes, stores, handles, processes, disposes of, or otherwise uses in the workplace. This includes information on the composition, and toxicological, eco-toxicological and other relevant properties of hazardous substances, including solvents and additives.

    - In addition to information concerning the installation and the chemicals on-site, management should co-operate with public authorities in the routing and identification of pipelines and transport routes outside the boundary fence of the hazardous installation that carry hazardous substances to and from the installation.

    - Management should never withhold information needed for the development of emergency plans. Thus, the claim that information is a trade secret or confidential business information should not be used as an excuse to withhold this information. However, arrangements should be made to help ensure that anyone who receives commercial information maintains its confidentiality, as appropriate.

- 5.b.9 Industry should co-operate with public authorities to ensure that the potentially affected public have the appropriate information to understand the risks they face and what they should do in the event of an accident. Management and other employees at hazardous installations should maintain close relations with community leaders, education facilities and other members of their local population in order to help promote education of communities concerning risk concepts.

- 5.b.10 Enterprises in the same geographic area (including, for example, enterprises within port areas or enterprises in an industrial site) should co-ordinate their on-site plans and response activities in order to ensure the plans are consistent, establish systems for mutual aid when needed, and help avoid domino effects.

c. PUBLIC AUTHORITIES

This section includes health/medical authorities and facilities.

- 5.c.1 Public authorities should establish guidelines and standards for developing off-site and on-site emergency plans.

- 5.c.2 Public authorities should ensure the development, implementation, testing and updating of off-site and on-site emergency plans in co-ordination with the management of hazardous installations and, as appropriate, with the participation of employees and representatives of relevant communities, recognising that the responsibility for the actual development and implementation of such plans will differ among countries.

  - Public authorities at various levels have responsibilities related to off-site and on-site emergency planning.
    - in general, central (national or regional) authorities should establish general principles concerning emergency planning and develop guidance for response activities and restoring any part of the environment damaged during an accident. They should also provide advice and assistance to local authorities (where appropriate), and ensure that officials at all levels are motivated to develop appropriate emergency preparedness and response capabilities; and
    - in general, public authorities at the local level should ensure that off-site and on-site emergency plans are developed and can be implemented consistent with the general principles.

  - The responsibility for the actual development and implementation of off-site emergency plans may rest with local officials or with a designated group/committee, depending on the laws and policies that are applicable in the locality, and may include involvement by regional or national authorities. It should be clear, however, who has the decision-making responsibility for developing and implementing the plans.

- 5.c.3 Public authorities should ensure that there is an adequate off-site emergency plan wherever there is a hazardous installation.

  - The off-site plan should:
    - set out its objectives;
    - provide relevant information on the hazardous installation and surrounding areas; and
    - establish the procedures to be followed, and identify the officials responsible, in the event of an accident.

  - Public authorities should give particular attention to ensuring that all hazardous installations, including SMEs and commercial users of hazardous substances, make an assessment of the full range of possible accident scenarios and undertake appropriate emergency planning. Specific assistance should be obtained, where necessary, to ensure that such enterprises and users fulfil their responsibilities in emergency planning.

- 5.c.4 Public authorities at all levels should integrate emergency planning for hazardous installations with emergency planning for natural disasters (such as floods, earthquakes and storms) and civil defence, as these activities involve many of the same requirements. This integration should result in co-ordinated and consistent emergency plans, and in a co-ordinated command structure. It should be kept in mind that natural disasters can trigger chemical accidents at hazardous installations, and can impede emergency response activities.

- 5.c.5 Public authorities should identify all parties who are expected to participate in an emergency response, as part of the development of an off-site emergency plan. In addition, the roles,

resources and capabilities of these participants should be realistically established and their commitment obtained.

- These participants should include, among others:
  - police, fire, medical (including hospitals), transport and welfare services;
  - emergency management or civil defence agencies;
  - public works and utilities;
  - the management of the hazardous installations;
  - public information/communication outlets; and
  - public health and environmental agencies.

- Emergency plans, in identifying the roles and responsibilities of all the parties concerned, should clearly indicate the chain of command and co-ordination among the parties, the lines of communication and the means of obtaining the necessary equipment, resources and information (*e.g.*, technical, meteorological and medical information).

- The plan should identify an emergency co-ordinating officer (on-scene co-ordinator) with the necessary authority to mobilise and co-ordinate the emergency services.

- The plan should make clear who has the authority to release and use emergency resources.

- Emergency plans should take into account potential conflicts in the objectives of various response personnel (for example, the police may try to protect evidence of wrongdoing while the fire and health services may not take this into account when trying to control the release of hazardous substances).

■ 5.c.6 The emergency plan, and emergency response personnel, should take into account that certain enterprises may not have the facilities and resources to respond in the event of an accident involving hazardous substances.

■ 5.c.7 Emergency plans should include detailed information for first responders on, *inter alia*, how the various response groups (including health/medical personnel) should work together, and how to undertake the identification, triage and initial treatment of victims.

■ 5.c.8 All personnel involved in the emergency response process (including, for example, first responders such as police, fire, and ambulance personnel) should be trained and educated on a continuing basis to ensure that a state of readiness for varying contingencies is maintained. Response personnel should also be involved in the emergency planning process so that they understand what actions to take in the event of an accident.

- Education and training programmes should be tested, assessed and revised, as appropriate, taking into account changes in emergency plans and arrangements, risks in the community, available resources, and other relevant factors.

- Emergency response training and education should, as a minimum, allow first responders to become familiar with:
  - the local emergency plan(s);
  - the hazardous installations in the community, including the results of the risk assessment of these installations;
  - the need for protective measures when responding to accidents involving hazardous substances, including the use of protective clothing and equipment;
  - important properties of different hazardous substances in their communities, and the means for responding to accidents involving such substances;
  - contamination hazards and procedures for decontamination;

- specific first aid measures; and
- possible adverse psychological effects on victims, emergency responders and the public.

⏩ Emergency response training and education should allow response personnel to take appropriate actions to minimise the adverse effects to health and the environment from accidents involving hazardous substances. It should also allow them to improve their ability to gather information concerning possible adverse effects on health or the environment.

⏩ As accidents involving hazardous substances are relatively rare occurrences, emergency plans should take into account the difficulty of maintaining the response skills needed and, to the extent possible, assign duties to response personnel which are consistent with (or related to) their regular, day-to-day responsibilities.

⏩ Health/medical personnel should contribute, where appropriate, to training those outside the health sector who are likely to be involved in emergency response activities.

⏩ There should be joint training and exercises among stakeholders who may be involved in the emergency response (including, for example, response personnel and health/medical personnel).

■ 5.c.9 Public authorities responsible for emergency response, including fire and rescue services, should familiarise themselves - in advance of any emergency - with the relevant information concerning hazardous installations in their area; this includes information on the chemical and physical properties (*e.g.*, toxicological and eco-toxicological properties) and location of hazardous substances, as well as information on the location of water and foam supply points and other firefighting equipment at the hazardous installations.

■ 5.c.10 Public authorities should ensure that emergency responders have access to sources of information (such as designated information centres) capable of providing the information needed in an emergency for the diagnosis, treatment and rehabilitation of persons injured by hazardous substances.

⏩ These centres, or other sources, should have information on:
- the hazardous substances involved in the accident;
- first aid and medical treatment;
- medical facilities and means of transporting victims;
- how and when to contact essential services;
- the command structure for the response; and
- lists of available experts.

⏩ Public authorities should determine the best approach for ensuring access to essential information.

⏩ Information sources could include specialised centres established to organise the collection, collation and dissemination of emergency planning and response information concerning human exposure to hazardous substances, such as poison information centres (PICs). They could also include academic institutions, industrial organisations, or other sources. Lists of information sources in various fields should be maintained.

⏩ Information should be available from the designated information sources/centres on a 24-hour basis every day of the year.

⏩ Representatives of information sources/centres should be available to participate in, or contribute to, the emergency planning process, as appropriate.

- Where there are more than one designated information source/centre in a country, they should be suitably linked.

- Networking among information sources should be promoted.

- Information sources/centres in different countries should share information and experience.

- An up-to-date list of national and international experts in various fields related to emergency preparedness and response should be maintained. In addition, there should be an international listing of groups of experts who can make themselves available to countries requiring assistance in the event of an emergency.[3]

■ 5.c.11 Emergency planning should take into account the range of possible health effects (acute effects, long-term effects and psychological effects) that could result from chemical accidents, and the response actions that should be taken to address these affects on response personnel, employees, and the community.

- It should be taken into account that health effects on exposed populations can be short-term and/or long-term. Adverse effects may appear immediately or some time after the accident. Such effects might be direct or indirect. Psychological effects, not necessarily related to exposure to the hazardous substances, could appear during or after the accident.

- Emergency planning should also take into account mechanisms for reducing stress on, and providing counselling services for, those with responsibilities for crisis management and communication.

■ 5.c.12 The emergency planning process should take into account the need to protect health care workers from exposure to hazardous substances.

- Such exposure could result from handling victims who have not been adequately decontaminated or from unexpected exposure at the site due to, for example, changes in wind direction.

- Health care providers normally should not enter contaminated areas, unless there are exceptional circumstances (*e.g.*, for triage or life-saving procedures). In such cases, they should be fully protected and accompanied by rescue personnel, and should not be allowed to exceed established exposure limits.

■ 5.c.13 Hospitals and other treatment facilities, which may be called on during response to an accident involving hazardous substances, should develop emergency plans (co-ordinated with the local off-site plan).

- These plans should describe systems/procedures for receiving and handling large numbers of patients at one time.

- These systems/procedures should address, for example: triage; arrangements for patient identification and documentation; and possible decontamination.

- Public authorities should ensure that these plans are in place, and should assist in their development.

(*See text box following para. 5.c.19, on Emergency Planning for Medical Facilities*)

- 5.c.14 As part of the emergency planning process, there should be an assessment of the types of emergency medical resources needed to respond to different types of emergencies and to the range of possible casualties.

- 5.c.15 As part of the emergency planning process, it should be ensured that adequate medical facilities are available, including transportation facilities.

  - Decontamination equipment for on-site and hospital use and, as appropriate, protective equipment for medical emergency response personnel should be available.

  - Public authorities, in co-operation with hospitals/treatment facilities, should establish back-up procedures and systems for moving and treating large number of victims if local hospitals and treatment facilities are inadequate (*e.g.*, insufficient capacity or lack of specialised facilities).

  - In order to accommodate emergency needs, provision should be made for the rapid transformation of facilities normally used for other purposes. For example, when access to hospitals is limited, alternative premises such as schools, sports facilities, and tents should be identified as places where temporary medical care could be provided to accident victims.

  - Emergency plans should indicate the protective measures that should be taken in the event a hospital or other treatment facility is contaminated, or otherwise is threatened as a result of an accident (*e.g.*, loss of electricity, structural damage, or when the hospital is downwind from a release of hazardous substances).
    - hospital/treatment facilities should make provision for evacuating patients or for decontamination in the event the facilities become contaminated; and
    - hospitals should also be aware that they may need to take special precautions if they have hazardous substances on site, or if they receive contaminated patients.

- 5.c.16 As part of the emergency planning process, the availability of oxygen should be ensured, as well as up-to-date antidotes and other pharmaceutical substances necessary for the treatment of persons injured by hazardous substances.

  - Antidotes and other pharmaceutical substances should be maintained so that they remain effective (*e.g.*, they should be properly stored and should not be kept past their recommended shelf life).

  - Public authorities and management of hazardous installations should promote the development of effective antidotes for those hazardous substances that have no (or insufficient) antidotes.

- 5.c.17 Both industry and public authorities should establish mechanisms to facilitate pooling and/or sharing medical resources in the event of an accident (within a community, between neighbouring communities, and between countries). Such medical resources could include facilities, equipment, supplies, information, and personnel.

- 5.c.18 Public health and education authorities should ensure the basic training of all relevant health/medical and paramedical professionals in the principles of medical toxicology and emergency medicine. This training and education should be continuous, with regular updating, taking account of changes in emergency plans and arrangements, risks in the community, available resources, and other relevant factors.

- 5.c.19 The organisation and planning of health-related response to accidents should involve veterinarians, biologists, and others familiar with the care of livestock, pets and wildlife, both in order to protect the animals and to provide support to their owners/caretakers.

EMERGENCY PLANNING FOR MEDICAL FACILITIES

Hospitals and other treatment facilities should develop emergency plans (co-ordinated with local off-site plans). As part of emergency planning, hospitals and other treatment facilities should:

- maintain an inventory of available equipment that might be needed, and have up-to-date information on how to obtain additional support;
- ensure that decontamination equipment and facilities are available (if not on-site, then by mobile units);
- maintain a register of health/medical personnel who could be called upon to assist the hospitals/facilities providing care during an emergency;
- have plans/procedures for sending patients to other hospitals/facilities when necessary (these plans/procedures should be developed in co-operation with other public authorities);
- have a designated (separate) telephone line, in service 24 hours a day every day, for use by emergency services in the event of an accident, with a back-up communication system established in the event the phone line is not available following an accident;
- have access to specialised information, and to specialists, for appropriate treatment of exposed victims;
- institute sampling procedures for the collection, storage and analysis of biological (human) specimens (this should include biological sampling, as soon as possible, of those who have been exposed or might have been exposed to hazardous substances, including those who do not exhibit any immediate symptoms);
- have procedures for registering all individuals who arrive at the hospital/treatment facilities for treatment as a result of exposure to hazardous substances;
- have procedures to protect other patients and staff from contamination; and
- establish mechanisms for follow-up and monitoring.

5.c.20 As part of the emergency planning process, public authorities should ensure that systems are in place to provide information to the public following an accident and the immediate emergency response.

- During and after an accident, timely, credible, sensitive, informed, factual and accurate information should be provided openly and continuously to the public.
- Such information should cover the off-site effects of the accident, the risks of further adverse off-site effects, actions to be taken by the public, and related follow-up information.
- To be effective and trustworthy, information provided to the public must be truthful, even if it means admitting responsibility for an error.
- Risk communication during an accident demands special techniques and systems that need to be defined. Such techniques and systems should be described in communication guidance materials and included in emergency planning and response training courses.

(See Chapter 7 on Communication with the Public)

5.c.21 For cases where an accident at a hazardous installation may have effects in neighbouring communities, emergency planning and response should be co-ordinated among the potentially affected communities. Where an accident may have transboundary effects, emergency planning and response should be carried out in co-operation with neighbouring countries. [4]

(See Section 16.a on Transboundary Co-operation)

5.c.22 Public authorities should establish procedures to recover costs from those responsible for accidents, in accordance with the "Polluter Pays Principle."[5]

- 5.c.23 When alerted to an accident involving hazardous substances, response authorities should activate their emergency plans, including mechanisms for ensuring that the public is notified and informed about what actions to take to minimise adverse consequences.

d. PUBLIC AND OTHER STAKEHOLDERS

Communities/public

- 5.d.1 Community representatives should participate in the development of off-site emergency plans. They may also add value in the preparation of on-site plans.

- 5.d.2 Community representatives should, where appropriate, help review the on-site and off-site plans to check that they are adequate and correspond to the risks identified in the community.

- 5.d.3 Community representatives should assist industry and public authorities in developing risk communication programmes and in giving information to the potentially affected public on actions to take, in the event of an accident involving hazardous substances, to mitigate adverse effects on health, the environment, and property.

- 5.d.4 Community representatives should participate in the development and implementation of tests/exercises of off-site emergency plans. They should be involved in the debriefing process, helping to identify the lessons learned during tests/exercises, and related follow-up activities.

(See text box following Section 4.a, on "Example of Community Representation")

Labour organisations

- 5.d.5 Labour organisations at all levels (local, national and international) have an important role in ensuring high levels of preparedness and response at hazardous installations.

  - Emergency planning programmes depend for their effectiveness on the fullest possible involvement of employees and their representatives.

  - Such involvement includes co-operation between labour organisations and management in the development, implementation, monitoring, testing and revision of emergency planning programmes so as to ensure effective transmission of information and maximise employee understanding of, and support for, emergency planning programmes.

  - In hazardous installations where there are joint labour/management health, safety and environment committees, emergency planning programmes should be discussed by such committees.

  - Employees and labour organisations can have an important role in ensuring that information to the local community is conveyed effectively. The support of employees and labour organisations in this role will add to the credibility of information provided to the local community.

- 5.d.6 Labour organisations should support emergency planning education and training of their members (including health, safety and environmental aspects).

  - Labour organisations are also responsible for training Safety Representatives who, in turn, are responsible for dealing with the health and safety interests of their members. In this regard, Safety Representatives play important mediation and communication roles between management and labour.

- The experience and understanding gained by labour organisations from their education and training programmes, and from their practical day-to-day experience, can provide sources of valuable feedback for emergency planning and response.

■ 5.d.7 Labour organisations should be involved in co-operative activities with management at the local, national, and international levels. The involvement and participation of labour organisations in the development, promotion, implementation, monitoring and revision of emergency planning programmes at the local, national and international levels provide regular opportunities for co-operation and exchange of experience, and for developing essential trust and building confidence.

Research/academic institutions

(See text box at the end of Chapter 4)

N*on-governmental organisations* (NGOs)

■ 5.d.8 NGOs should play a role in increasing public awareness of risks and risk concepts (both in general and with respect to specific hazardous installations), in helping to educate the public with respect to actions to be taken in the event of an accident, and in providing humanitarian support in the event of an accident.

- NGOs often receive requests for information from members of the public who might otherwise not have easy and direct access to information, or who might have difficult in fully understanding the information and its implications.

- Local groups (such as environmental groups) can help promote more focused discussions between representatives of hazardous installations and the community.

- NGOs should take part in discussions about risk acceptability/tolerability, and co-operate in increasing public awareness about risks.

UNEP's APELL PROGRAMME

The APELL Programme ("Awareness and Preparedness for Emergencies at Local Level") has been developed by UNEP to minimise the occurrence and harmful effects of technological accidents and emergencies by raising awareness of local communities and by improving the communication among parties. It provides a well-structured, detailed process for developing a co-ordinated, integrated and well-functioning emergency response plan for local communities.

APELL is a tool for bringing people together to allow effective communication about risks and emergency response. The communication in turn leads to an action agenda.

The process of dialogue, as recommended in the APELL procedure, should help to:
- reduce risk;
- improve effectiveness of response to accidents;
- allow people to react appropriately during emergencies.

For further information about the APELL Programme,
see: http://www.uneptie.org/pc/apell/home.html

Chapter 6

LAND-USE PLANNING

The development and implementation of land-use planning arrangements (both zoning and siting) contribute to both prevention and mitigation of accidents involving hazardous substances. Land-use planning can be viewed as a preventative measure in that it helps to ensure that hazardous installations and other developments are separated by appropriate distances, thereby preventing adverse effects, or it can be viewed as a means to mitigate adverse effects of releases, fires, explosions and other accidents.

While land-use planning is an essential element in the strategy for controlling risks associated with accidents involving hazardous substances, it is complementary to, but not a substitute for, other prevention and mitigation measures.

It is important to recognise that land-use planning in this context applies not only to the zoning and siting of hazardous installations, but also to significant modifications to existing installations. It also is very important to include land-use planning considerations when making decisions concerning proposals for developments in the vicinity of an existing hazardous installation (e.g., homes, schools, shops and other commercial properties, and public infrastructure such as railroad stations).

It is noteworthy that in some countries, land-use planning is done at a national level in co-operation with local authorities, whereas in other countries it is strictly a local concern.

(Given the dual role of land-use planning, some related text is also included in Section 3b. For a complete picture of the subject, it is important to read both sets of provisions).

- 6.1 Public authorities should establish land-use planning arrangements to ensure that new hazardous installations are appropriately sited with respect to protection of health, environment, and property in the event of an accident involving hazardous substances. In addition, land-use planning arrangements should control other developments (residential, commercial, public infrastructure, *etc.*) in the vicinity of hazardous installations.

  - Land-use planning arrangements should not have unintended effects of increasing the overall level of risk of individuals potentially affected in the event of an accident.

  - In this regard, public authorities should take into account concerns for environmental and social equity.

  - When making decisions concerning siting of installations, public authorities should take into account all of the hazards in the area in order to limit, to the extent possible, any overall increase in risk to health, the environment and property.

- 6.2 The land-use planning activities of local, state/regional and national public authorities should be co-ordinated.

  - State/regional and national authorities should develop the overall objectives to be met (with supporting technical information and guidance) to achieve consistency in criteria at the local level.

- Local authorities, at an appropriate level, are usually in the best position to make the specific planning decisions, taking into account local social and economic factors.

- 6.3 Land-use planning arrangements should include mechanisms for enforcement of zoning and siting decisions. The mechanisms for applying and enforcing land-use planning for safety purposes will vary from one country to another as a result of differing cultures, population, and legal systems, although some general principles can be identified.

- 6.4 Land-use planning processes and arrangements, as well as related control mechanisms, should provide a clear indication of the standards to be met, and of the evaluation procedures used by public authorities (for new hazardous installations, changes to existing installations, and proposed residential and other developments near existing hazardous installations).

  - While land-use planning decisions (with respect to both zoning and siting of hazardous installations) generally take into account social and economic factors, it is important that decision-making processes are transparent and that all decisions are consistent with the goal of achieving a high level of safety.

  - Different types of approaches can be used for land-use planning. These include, for example: a consequence-based approach (identifying areas where serious injuries will occur based on an assessment of the impacts of a number of possible event scenarios for a specific site/installation); a risk-based approach (identifying areas where there is a given probability of a specified level of harm based on an assessment of both consequences and probabilities of possible event scenarios for a specific site/installation); and a generic approach (establishing safety distances based on the type of activity rather than a detailed analysis of a specific site/installation).

- 6.5 The availability of external emergency response capability (including, *e.g.*, trained staff, equipment) should also be part of land-use planning considerations. In this regard, land-use planning arrangements should take into account the importance of locating hospitals and treatment facilities in areas where they are not likely to be affected in the event of an accident involving hazardous substances.

- 6.6 Where a specific area with existing hazardous installations may not be able to meet current guidelines for land-use planning in the short-term, measures should be considered to alleviate the risks in the longer term, for example by modifying the installations or by phasing out older installations and/or residential buildings near the site. Such a phase-out may involve the need for compensation to property owners.

- 6.7 The public should be given the opportunity to provide input into decision-making processes related to siting of hazardous installations. The potentially affected public should also be provided with notification of applications for siting, as well as licensing, of hazardous installations. Decisions concerning such applications should also be publicised.[6]

Chapter 7

COMMUNICATION WITH THE PUBLIC

This Chapter addresses the subject of provision of information to the public as a critical element in emergency preparedness/mitigation (as well as in prevention and response programmes). The Guiding Principles recognise that communication with the public is a joint responsibility of public authorities and industry, and that different countries and communities allocate responsibility for communication differently. Furthermore, the Guiding Principles take into account that communication channels need to be two-way, and that members of the community should participate in the development and implementation of communication programmes.

- 7.1 Members of the public who might be affected in the event of an accident have a right to appropriate information so that they can be aware of the hazards and risks arising from the hazardous installations in their community, and are able to act appropriately should an accident occur.

- 7.2 The information provided to the potentially affected public should include specific guidance on what to expect in the event of an accident, including:
  - details about how the potentially affected public will be warned of an accident, or imminent threat of an accident;
  - guidance for the potentially affected public concerning the actions to be taken and the behaviour to be adopted in the event of an accident (this guidance should be adapted to meet the needs of different groups, including sensitive groups, *e.g.*, in hospitals, schools, homes for the aged, *etc.*);
  - an explanation of why they should behave/act as described in the guidance so that they understand how this will result in a mitigation of adverse effects;
  - source(s) of post-accident information (*e.g.*, radio or television frequencies);
  - source(s) for additional explanations/information;
  - point(s) of contact, where members of the public can provide public authorities with information related to a possible accident (*i.e.*, if someone notices something unusual at the installation); and
  - how members of the public will be informed when the emergency situation is over.

  - This information should be provided in a timely fashion, be reissued periodically as appropriate, and be updated as necessary.

  - It should be clearly indicated that this information should be read immediately and be kept in a convenient place for reference in the event of an accident.

  - Public authorities should ensure that the information is provided, although it is up to each country/community to decide who should provide this information.[7]

- 7.3 The types of information identified in para. 7.2 above should be provided to the potentially affected public without their having specifically to request it ("active information"), and there should also be a repository identified where the public can obtain the information upon request.

- 7.4 The potentially affected public should also be provided with additional information about the hazardous installations in their vicinity, without their having specifically to request it. This information should address:
    - the types of industries in their area and the chemicals that are produced and used in these installations (the common names or, if more appropriate, the generic names or general danger classification of the substances involved at the installation that could give rise to an accident capable of causing serious off-site damage, with an indication of their principal harmful characteristics);
    - the name(s) of the enterprise(s) responsible for the installation(s) and the address(es) of the installation(s);
    - information relating to the types of possible accidents that could cause serious off-site damage, and their potential effects on health, the environment, and property;
    - the preventive measures that have been taken to minimise the likelihood of accidents;
    - a reference to the off-site emergency plan;
    - point(s) of contact, where further explanatory information and clarifications can be obtained and feedback can be provided to rescue services and other authorities; and
    - information concerning expected activities at the installation that may raise concerns of neighbours (*e.g.*, flares, odours).[8]

- 7.5 The members of the public potentially affected by an accident should be carefully delineated, and the information should be targeted, so that all potentially affected people have adequate and appropriate information presented in an easily understandable manner.

    - In defining the targeted audience for such information, it may be helpful to use natural community groupings or boundaries to avoid disseminating different information among members of the same community.

    - It is important to recognise that the public is not homogeneous and, therefore, consideration should be given to whether there is a need to design different messages for different groups based on, *e.g.*, age, gender, culture/language, educational background, level of risk, *etc.*

    - Efforts should be made to provide information to anyone who moves into, or starts working in, the area potentially affected in the event of an accident.

    - The information provided to the public should be generally comprehensible (*i.e.*, to individuals without technical knowledge or training) and be provided in a format and/or language that is easily read and understood. Members of the community should be consulted to help ensure that the message developed and language used are appropriate for the community.

    - The information on actions to be taken in the event of an accident needs to be realistic or there will be a loss of credibility (*e.g.*, it would not be appropriate to tell people in a campsite to shelter in place).

    - The information should permit all relevant individuals to understand their responsibilities (for example, teachers require special information and training in view of their responsibilities in the event of an accident, and to assure parents that their children will be safeguarded).

- 7.6 In order to avoid confusion and facilitate information exchange, the mechanisms for obtaining and delivering information should be as clear as possible and use, to the extent possible, known and existing channels.

    - Those designing means for providing information to the public should take into account experience obtained in risk communication in other, related fields (*e.g.*, natural disasters).

- Members of the community should be consulted when the process for communicating with the public is being designed and implemented.

7.7 In order to enhance individual recall and help ensure that all target audiences are reached, the messages should be repeated periodically and different methods/channels of communication should be used.

7.8 Those responsible for designing communication programmes should recognise that messages will be interpreted by the recipients, filtered based on individual experience and evaluated based on levels of trust and other factors (such as whether there have been conflicting messages). It is important to understand these influences and shape the messages accordingly.

- The design of the communication programme should take into account what people actually do in the event of an emergency, based on observations or experience, not on what they say they will do.

- The predictable reactions of the public should be taken into consideration when developing emergency response instructions. In this regard, the reactions of the public to stressful, unanticipated events are often determined by instincts rather than by training and information. For example, parents will instinctively want to collect their children from school even if this will put them and their children at a greater risk of harm.

7.9 In addition to targeting information at the potentially affected public, public authorities should also educate the general public about the risks associated with accidents involving hazardous substances (and other emergencies) and the types of actions that should be taken in the event of an accident. This is important because people are mobile (moving in and out of risk zones), and because certain sources of risk are mobile.

7.10 The responsibility for communicating information concerning hazardous installations should be assigned to individuals with appropriate knowledge and skills, who are viewed as knowledgeable and credible, who instil confidence, and who enjoy respect in the community.

7.11 There should be opportunities for public authorities, industry and the public to consult with each other concerning the types of information that should be made available to the public (both active information and information provided upon request).

- Public authorities should also initiate discussions with the public, and other stakeholders, on the acceptability/tolerability of risks so that the public becomes familiar with risk concepts and is better able to participate in relevant decision-making processes.

- Public authorities should consider the possibility of creating community groups for these purposes, as appropriate.

(See text box following Section 4.a, relating to "Example of Community Representation")

7.12 Employees should play a role in helping to inform and educate the members of their community. Informed employees can act as important safety ambassadors within their community, since they have a strong incentive to protect themselves, their families and their neighbourhoods.

7.13 As the media are a channel of information to the general public, media input should be encouraged in the development and implementation of the communication process related to emergency planning.

- There should be clearly identified media source(s) for obtaining information in the event of an accident, and the public should be informed about these sources.

- Industry and public authorities should provide representatives of the media with relevant information concerning hazardous installations so that the media have the necessary background to be an effective and reliable source of information for the public should an accident occur.

- Members of the media should remain an objective source of information concerning hazardous installations and accidents that occur, and therefore should limit any possible conflicts of interest.

7.14 Policymakers and other stakeholders, including the public, should be informed and educated about the possible actions that response personnel may take in the event of an accident, bearing in mind that in some cases the most appropriate action is no or limited intervention by responders in order to minimise the adverse effects on health, environment and property. Policymakers and the public need to understand why response personnel may limit their intervention in order to avoid public or political pressure to take a more detrimental approach.

(*See para.* 10.11)

7.15 Procedures should exist for public input in the development of off-site plans.[9]

(*See Section 5.d on the role of the Public and Other Stakeholders in Emergency Preparedness and Planning*)

7.16 In cases where a hazardous installation is located near a border, mechanisms should be in place to ensure that information is provided to all stakeholders on both sides of the border potentially affected in the event of an accident.

(*See Section 16.a on Transboundary Co-operation*)

7.17 Efforts should be made to facilitate the exchange of information between communities and countries on best practices related to communication with the public.

NOTES

1. Work is underway to improve understanding of the health effects of acute exposure to specific chemicals through several national and international projects, such as the US-based Acute Exposure Guideline Levels (AEGLs) project, and the EC ACUTEX project to develop innovative approaches for defining acute exposure levels that could be used for emergency planning and land-use planning.

2. It should be recalled that the term "employees", as used in this publication, includes (sub)contractors.

3. For example, the International Directory of Emergency Response Centres, which has been jointly published by the OECD, UNEP and OCHA, may provide a basis for such a listing.

4. See UN/ECE Conventions on Transboundary Effects of Industrial Accidents and on the Protection and Use of Transboundary Watercourses and International Lakes, as well as the OECD Council Decision C(88)84(Final).

5. See OECD Council Recommendation C(89)88(Final).

6. See OECD Council Decision- Recommendation C(88)85(Final).

7. See OECD Council Decision-Recommendation C(88)85(Final).

8. See OECD Council Decision-Recommendation C(88)85(Final).

9. See OECD Council Decision- Recommendation C(88)85(Final)

Part C

EMERGENCY RESPONSE

This Part addresses the roles and responsibilities of industry, public authorities, the public and others in responding to chemical accidents. It is significantly shorter than Part B (Emergency Preparedness/Mitigation) since response activities should consist primarily of implementing the emergency plans, assuming that the planning process was complete and effective. (See Chapter 5 on emergency preparedness and planning.)

The focus of the activities described in this Part is the local area where an accident has occurred; therefore, the public authorities addressed here include local response authorities (e.g., fire, emergency medical and police) and local/regional government agencies, as well as health/medical facilities.

Chapter 8

GENERAL PRINCIPLES

- 8.1 Systems should be in place to immediately alert response personnel in the event of an accident involving hazardous substances, or an imminent threat of an accident, which would require their involvement.

  - This notification to response personnel should trigger the implementation of the emergency plan.

  - Systems should be activated to warn the members of the public who might be affected by the accident.

- 8.2 The parties responsible for emergency response should be involved in the planning process. Following the response, the emergency plan should be reviewed and revised, as appropriate, in light of the experience gained.

- 8.3 In the event of an accident involving hazardous substances, stakeholders should take all reasonable measures to minimise exposure of people and the environment to such substances and to limit adverse effects to health, the environment and property.

- 8.4 Spokespeople designated to provide information to the public after an accident (including those from industry and public authorities) should have the necessary knowledge, skills, authority and credibility to effectively communicate with the public.

  - Official spokespeople should be as open as possible in providing information during and after an accident.

  - In this regard they should, for example, be timely in presenting information, admit when information is not available, avoid making promises which cannot be fulfilled, be the first to give bad news, and ensure that the messages provided are consistent with actions taken.

Chapter 9

INDUSTRY

- 9.1 In the event of an accident involving hazardous substances, management of the hazardous installation should immediately activate its on-site emergency plan.

- 9.2 In the event of an accident involving hazardous substances that result, or threaten to result, in harm to health, the environment or property off-site, or otherwise cannot be handled by on-site response resources, management or other employees of a hazardous installation should promptly alert local emergency response authorities.

NOTE: *This is different from requirements for industry to notify public authorities that an accident has occurred, e.g., for record-keeping or enforcement purposes (see Chapter 14).*

  - Once alerted of the accident, public authorities should trigger implementation of the off-site emergency plan, beginning with an initial assessment of the situation leading to a decision concerning which response actions are required.

  - Management should be prepared to assist response personnel with information, expertise and other resources, as needed.

- 9.3 Emergency plans should contain clear criteria that establish when public authorities should be called in to respond to accidents with potential off-site effects.

  - These criteria should make it clear at what stage to contact public authorities, and whom to contact.

  - The fact that public authorities are involved in response does not change the fact that the enterprise remains responsible for the safety of its installations, including the adverse effects of any accidents.

Chapter 10

PUBLIC AUTHORITIES

- 10.1 When alerted to an accident involving hazardous substances, response authorities should activate their emergency plans.

  - The objective is to put into place the arrangements needed to localise the accident and, if possible, contain it and thereby minimise the harmful effects on health, the environment, and property.

  - The emergency plan should include mechanisms for ensuring that the public is notified of the accident and informed about what actions to take to minimise adverse consequences.

- 10.2 The on-scene co-ordinator should decide on the immediate actions to take to avoid or limit exposure of humans to hazardous substances, both on-site and off-site.

  - This should include measures to avoid contamination of rescue workers.

  - The on-scene co-ordinator should be prepared to obtain information and advice from the management of the enterprise, as well as from other experts, concerning how best to protect health, environment and property from the hazardous substances involved in the accident.

  - Health/medical and response personnel should provide, upon request, assistance to the on-scene co-ordinator concerning the immediate actions to take in order to avoid or limit exposure of employees, rescue workers and the public.

- 10.3 In cases where a toxic substance is released, the decision on whether the potentially affected public should shelter indoors or be evacuated should be taken by the on-scene co-ordinator or other persons designated in the emergency plan. The decision made should be based on likely exposure and possible health effects.

- 10.4 Recognising that immediate response decisions tend to be primarily driven by the need to protect people from acute toxic effects, response decisions should also take into account the possible long-term or delayed effects on health from exposure to the hazardous substances (direct and indirect) and possible environmental impacts.

  - Response personnel (including health/medical personnel) should recognise that individuals exposed to hazardous substances may be adversely affected even if they do not have obvious, immediate symptoms. Therefore, exposed persons should be put under observation and, as appropriate, be given immediate treatment and transport to treatment facilities.

  - Information should be available to support decision-making concerning how to treat people who have been exposed to chemicals and may have long-term, delayed, or unobserved adverse effects.

(*See Chapter* 13 *on Medical Aspects of Follow-up to incidents*)

- 10.5 Arrangements should be made for the provision of first aid and other medical treatment, where possible, outside the contaminated area.

  - Access to the contaminated areas should be strictly controlled, limiting entry only to necessary response personnel.

  - In general, initial care should be administered near the accident site, outside the range of contamination, so that the injured can receive the treatment they need in order to be in stable condition before being taken (if necessary) to a main treatment facility.

  - The most critical action is to remove the individual from further exposure to the hazardous substance(s). Physiological and psychological effects may then be addressed.

  - In addition to general first aid measures, it may be necessary to begin other treatment at the accident site. Therefore, special equipment and supplies, including antidotes, should be readily available at the site, as appropriate.

- 10.6 Response personnel (and others, as appropriate) should follow the same triage rules for victims of accidents involving hazardous substances as those that generally apply in emergency situations. Members of sensitive populations (such as children) should normally be given higher priority for medical care.

- 10.7 Systems should be in place to obtain the equipment, specialists and other resources needed for the response. This could include obtaining assistance, as needed, from regional or national authorities, or from emergency responders in neighbouring or other appropriate communities.

- 10.8 The first responders to an accident should have sufficient information, education, training and experience to be able to assess quickly whether they can deal with the situation, or whether additional support (such as persons with particular expertise) should be summoned.

  - Systems should be available which provide for immediate, on-the-spot access to information that can be used to assess and respond to an emergency. In addition, systems should be in place for the collection, dissemination and updating of information that is to be made available to health/medical personnel and other relevant parties as the emergency response progresses, including medical information or advisories given to the public *via* the media.

  - Guidance should be available concerning the choice of tactics to respond to an accident, recognising that it may be necessary to make the choice with limited time and incomplete information.

- 10.9 The information used to support response actions, which should be updated and disseminated on a regular basis, includes:

  - Information on the quantity and nature of the hazardous substance(s) involved in the accident including, for example: physico-chemical properties; possible transformation of degradation products of the substance(s), such as when in contact with water or through pyrolysis; toxicological and eco-toxicological properties; clinical effects, including acute, delayed and long-term effects; and risk assessments.

  - Guidance concerning the levels of acute exposure to various hazardous substances, likely adverse effects, and methods for protecting against such effects.

  - Information on the expected number and types of patients, the nature of their injuries and the severity of exposure.

- Information on first aid and medical treatment; the nature of the information should be appropriate for the target audience including, for example, the lay (not medically qualified) person, the general practitioner, and the specialised medical expert (such as an intensive care professional). This information should address:
  - signs, symptoms and time of onset expected following different types and routes of exposure, such as via the eye, inhalation, skin absorption, and ingestion;
  - how to decontaminate victims;
  - how to undertake triage and registration of a potentially large number of victims (taking into account local circumstances);
  - medical treatment (including use of antidotes where applicable), depending on the circumstances, severity of victims' condition, and availability of hospital or other treatment facilities;
  - when those initially without symptoms may be expected to develop them (after a delay of hours or longer);
  - how to collect and store samples for toxicity and other analyses;
  - protective measures that should be taken by medical and emergency response personnel to avoid becoming contaminated;
  - the location of necessary pharmaceutical supplies; and
  - the location of laboratories and the types of analyses that they can perform.

- Information on available resources and facilities including:
  - medical facilities (*e.g.*, the location of health care centres, hospitals and dispensaries together with the types of facilities that they can provide such as number of beds, mechanical ventilators, oxygen supply and special equipment);
  - pharmaceutical supplies;
  - decontamination facilities;
  - additional medical staff including specialists;
  - biological monitoring services; laboratory facilities; and
  - information sources.

- Means of transporting victims (ambulances, helicopters).

- How and when to contact essential services, including central authorities, local authorities, and police, fire and other rescue services.

- Who has the local co-ordinating role in an emergency and the criteria that determine the transfer of command-and-control to a higher authority.

- Lists of experts (from industry, public authorities, *etc.*) who can advise on particular hazardous substances or groups of hazardous substances.

- The medical information or advisories provided to the public *via* the media.

10.10 For cases where the response requirements go beyond what was foreseen in the emergency plan, or other difficulties are encountered (*e.g.*, the safety of responders is at risk), the on-scene co-ordinator should seek assistance.

- This assistance could include information from outside specialists (knowledgeable in, *e.g.*, toxicology, chemical engineering, medicine, *etc.*) who may be able to provide fast reliable information. This should be in a form that can be understood and acted upon by response personnel. The types of information that might be needed include, for example:
  - identification of the hazardous substances involved;
  - suggestions for appropriate actions to take;
  - evaluation of the hazard;

- need for protective equipment;
- control and containment of the hazardous substances; and
- decontamination and emergency termination activities.

▸▸ In the event an accident cannot be controlled using local response resources (*e.g.*, equipment, supplies, personnel), requests should be made to get support from, as appropriate, neighbouring communities, regional or national authorities, and/or other countries.

■ 10.11 Despite the natural inclination and pressure to be pro-active in responding to a chemical accident, emergency response personnel should be aware that, in some stages of the response, the most appropriate action is no or limited intervention by responders in order to minimise the adverse effects on health, environment, and property.

▸▸ Any type of response (including limited intervention) requires appropriate monitoring and follow-up to ensure that all consequences are recognised and actions, where needed to protect health and the environment, are undertaken.

▸▸ It is important that decisions concerning appropriate actions may change over time, in light of changes in the circumstances and availability of updated information.

■ 10.12 Hospitals and other treatment facilities should put their emergency plans, and their part of the community emergency plan, into effect as soon as they are alerted that there is a possibility of patients arriving as the result of an accident involving hazardous substances.

■ 10.13 During an emergency response, health/medical personnel and facilities should be part of the overall response team and part of the information chain, in order to provide and receive information as appropriate.

■ 10.14 Hospitals and other treatment facilities that may be involved in responding to an accident should be provided, as soon as possible, with information on the hazardous substance(s) involved, the type of accident (spill, fire, *etc.*), the likely number of victims, and the nature of their injuries.

▸▸ This information should be used to make an early determination of possible human health effects, and the most appropriate therapy or care.

▸▸ Protocols for treatment should be available and, in most cases, should be followed particularly if accident victims are taken to a number of separate treatment facilities (recognising, however, that some flexibility is necessary to account for individual sensitivities and other relevant factors).[1]

(*See text box in chapter 5 on Emergency Planning for Medical Facilities*)

■ 10.15 For the appropriate treatment of exposed victims, health/medical personnel should have access to specialised information and should consult, as appropriate, with a variety of specialists (for example, toxicologists, lung and respiratory specialists, ophthalmologists, haematologists, and occupational health physicians).

■ 10.16 Following an accident, there should be psychological support at an early stage, where appropriate. Specifically, professionals/counselors with psychiatric, psychological or psycho-social training should be available in a timely manner.

▸▸ These professionals/counselors can provide emotional support to victims, friends and relatives of victims, and response personnel, collaborate with information services, assist in screening for potential mental health problems, and assist in establishing follow-up network(s) to identify and treat those with psychological reactions.

- The planning process should take into account the role of other care-givers in providing emotional and psychological support (*e.g.*, clergy, funeral directors), in particular in communities without access to adequate numbers of psychologists or psychiatrists.

- In high-risk areas, epidemiological data and internationally accepted instruments for the assessment of mental health impacts should be available so that monitoring can take place following an accident.

10.17 When an accident results in death(s), any people handling the remains (such as response personnel, medical examiners, morticians) should be protected against possible contamination from the hazardous substances. Someone should be designated in the emergency plan with the responsibility for providing information and assistance to people handling contaminated remains.

10.18 Public authorities, at regional or national level, should support local response operations to the extent possible to help protect health, the environment and property. Such support could include, but is not limited to:

- providing technical, scientific, policy, meteorological, and legislative information and advice to response personnel;
- undertaking inspections and sampling to determine the extent of contamination;
- identifying environmental resources and animals at risk, spill behaviour predictions, weather forecasts, and priorities for protection; and
- providing guidance on the protection and clean-up of affected wildlife.

10.19 Response personnel (and others involved in response activities) should document decisions and actions taken during response to an accident (*e.g.*, notification actions, evacuation/sheltering decisions, *etc.*) in order to be able to review the effectiveness of the intervention, to learn from experience, to improve emergency plans, to have input into an investigation, and to learn lessons for future response activities. This experience should be shared, as appropriate, with other enterprises/communities.

10.20 During the transition between emergency response/rescue operations and clean-up activities, all those involved should co-operate and exchange information in order to maintain safety and protect and/or restore the environment and property.

10.21 Public authorities should implement the procedures related to the "Polluter Pays Principle", when appropriate, to recover costs from those responsible for an accident.[2]

Chapter 11

PUBLIC AND OTHER STAKEHOLDERS

a. PUBLIC/COMMUNITIES

- 11.a.1 Members of the potentially affected public should be aware of the warning alert systems used in the event of an accident involving hazardous substances. Once warned of an accident, they should follow instructions provided during the planning process and any additional instructions provided through designated channels of information.

- 11.a.2 Members of the public should look to the relevant public authorities to provide information following an accident, during the immediate emergency response phase, and following the accident, using systems that are well-known, readily accessible and understood.

- 11.a.3 Members of the public should notify appropriate officials when they notice an unusual situation at a hazardous installation.

b. MEDIA

- 11.b.1 The media should have ready and continuous access to designated officials with relevant information, as well as to other sources, in order to provide essential and accurate information to the public throughout the emergency and to help avoid confusion.

  - Efforts should be made to check the clarity and reliability of information as it becomes available, and before it is communicated to the public.

  - Public health authorities should be consulted when issuing statements to the media concerning health aspects of chemical accidents.

- 11.b.2 Members of the media should facilitate response efforts by providing means for informing the public with credible information about accidents involving hazardous substances, including guidance on actions to be taken by those potentially affected in order to minimise adverse effects on health, as well as on the environment and property. The media should not hinder response activities (for example, by seeking access to restricted areas).

c. NON-GOVERNMENTAL ORGANISATIONS (NGOs)

- 11.c.1 NGOs could provide a valuable source of expertise and information to support emergency response efforts. Members of NGOs could assist response personnel by performing specified tasks, as planned in advance during the emergency planning process. Such tasks could include providing, for example, humanitarian, psychological and social assistance to members of the community and response personnel (*e.g.*, Red Cross), assistance in connection with assessing and responding to environmental consequences of accidents, and support for animal welfare.

NOTES

1. The International Programme on Chemical Safety has developed protocols/treatment guides.

2. See OECD Council Recommendation C(89)88(Final).

Part D

FOLLOW-UP TO INCIDENTS (Accidents and Near-Misses)

This Part deals with the actions to be taken after an accident or near-miss has occurred, and following immediate response activities. The focus is on learning from the experience in order to avoid similar incidents in the future; this Part therefore addresses assessment of consequences, incidents reporting and investigations.

This publication does not address the issues associated with recovery following an accident, such as environmental clean-up. However, it does recognise that actions taken during the response phase can affect the recovery activities and, therefore, response efforts should be designed to provide the information and infrastructure needed for recovery.

Chapter 12

ASSESSMENT OF CONSEQUENCES

(See also Chapter 13 below on Medical Aspects of Follow-up)

- 12.1 Assessments of the consequences of chemical accidents (including environmental consequences) should be generated as soon as possible after an accident occurs.

  - Protocols should be developed that identify the types of measurements that should be made, and how to undertake the appropriate assessments (recognising that differences in approaches exist between countries).

  - Individuals involved in field missions should be trained, for example, in collecting samples and understanding possible environmental impacts.

  - Further use should be made of new technologies, such as satellite and other remote sensing systems, to identify contaminated areas, as well as to improve early warnings of areas where there is a significant risk of environmental damage in the event of a chemical accident.

  - The "Polluter Pays Principle" should be applied, as appropriate, so that adequate resources and personnel are available to assess the environmental consequences of accidents. The application of the Polluter Pays Principle and also act as a major incentive for management of hazardous installation to do everything in their power to avoid such accidents. [1]

- 12.2 Efforts should be made to improve understanding of the environmental consequences of accidents.

  - In order to be able to assess the environmental consequences of accidents, preparedness activities should include development of baseline geographical and geological information for the areas around hazardous installations. In addition, monitoring should be in place for areas of particular environmental concern.

  - Relevant parties should document the adverse impacts on the environment of any significant accidents, and publish the results.

  - Areas affected by accidents involving hazardous substances should be monitored to determine if there are any long-term or delayed consequences of acute exposures.

  - There should be further information sharing related to the environmental consequences of accidents, and an international effort should be made to collectively review and assess such data. In this regard, efforts should be made to ensure reporting of environmental data on past accidents to databases such as the one being managed by the EC Major Accident Hazards Bureau (MAHB) on behalf of the EC, the OECD and the UNECE.

Chapter 13

MEDICAL ASPECTS OF FOLLOW-UP

- 13.1 Appropriate epidemiological and medical follow-up procedures should be put into place for monitoring and observation of persons exposed to hazardous substances, including those who are seemingly unaffected by the exposure. The onset of symptoms may be delayed for hours or days following exposure. Early examination will assist in later diagnosis and treatment of symptoms.

  - Public authorities should ensure that persons who have had significant exposure to toxic chemicals during an accident, whether they appear affected or not, are examined and properly registered to allow for short- and long-term follow-up. This registration process should be part of the response activity.

  - Biological samples of those exposed (or likely to have been exposed) should be taken as soon as possible after exposure and, where appropriate, at regular intervals.

  - There should be a structured approach to monitoring and sampling to ensure quality of data collection and analysis, and provide a basis for comparison over time and between events.

  - It may be necessary to seek out individuals likely to have been exposed to ensure adequate observation and treatment.

  - There should be an accurate record of follow-up activities.

- 13.2 After a significant accident, appropriate epidemiological protocols and sampling methods should be defined and applied in order to characterise the accident, to help limit the adverse consequences for health and the environment, and to learn from the accident experience. To improve the value of any monitoring/sampling, there should be information available concerning the immediate environment and population before the accident (such as background levels of exposure and the nature of the local ecosystems).

- 13.3 Further efforts should be made to share information concerning the long-term and short-term health effects of acute exposure to hazardous substances.[2]

- 13.4 Further efforts should be made to promote the sharing of information among health/medical professionals (including research scientists) concerning appropriate treatment, and epidemiological and health follow-up to accidents involving hazardous substances.[3]

Chapter 14

INCIDENT DOCUMENTATION AND REPORTING

(reporting of past accidents and near-misses)

a. GENERAL PRINCIPLES

■ 14.a.1 Management of hazardous installations, as well as industrial organisations, public authorities, and other stakeholders, should consider how to create a climate that fosters trust and encourages voluntary sharing of information concerning accidents and near-misses, including lessons learned.

- Mechanisms to foster an open and frank exchange of information related to accidents and near-misses, both within an enterprise and among enterprises, should be further developed and encouraged. There is an obvious need to capture and share such information widely throughout industry, so that enterprises can learn from the experience of others.

- In addition to information sharing within industry, means should be developed to involve public authorities in this effort without jeopardising the enterprises' interests.

b. PUBLIC AUTHORITIES

■ 14.b.1 Public authorities should require prompt notification/reporting (to an appropriate authority) of the key elements of accidents involving hazardous substances that meet specified criteria. This notification should be followed up by formal written reports providing additional information concerning the accident.

■ 14.b.2 Public authorities should establish appropriate criteria, requirements and procedures for documentation of all significant incidents. This includes both the documentation by emergency response personnel, as well as documentation by the management of the installation where the accident occurred.

- Efficient documentation by industry and public authorities can make an important contribution to the safe operation of hazardous installations. Incident documentation also helps to instil public confidence that proper actions will be taken to avoid similar incidents, or incidents with similar consequences, in the future.

- Documentation should not be limited to significant accidents, but should also address important near-misses.

- Documentation should provide the basis for determining which incidents should be subject to investigations, and should help identify trends and areas of concern, identify causes and consequences of incidents, provide a basis for learning from experience, and lead to remedial action to correct any deficiencies in technology or procedures which led to the incident.

- Reports of past accidents submitted by industry to authorities should include information on the environmental, as well as health effects of accidents. Economic impacts of accidents

should also be assessed to the extent relevant information is available (with economic impacts broadly defined to include, for example, both direct and indirect costs).

- Public authorities should encourage the voluntary reporting by enterprises to public authorities of accidents and significant near-misses beyond what is legally required.

- 14.b.3 Public authorities should establish a structured national system for maintaining statistics and information on accidents involving hazardous substances.

  - Such a system will: facilitate improved decision-making; provide insights for better regulations and guidance; assist in establishing priorities; aid in the preparation of analyses; and facilitate the dissemination and exchange of information and lessons learned.

  - Public authorities and industry should promote further efforts to improve the international exchange of information on significant accidents and near-misses involving hazardous substances. Statistics and information from national systems should feed into international systems for such accidents and near-misses in order to promote safety, learn from the experience of others, and provide sufficient data for meaningful analysis and statistics.[4]

c. INDUSTRY

- 14.c.1 Management should comply with all established procedures for notifying/reporting incidents to public authorities.

- 14.c.2 Local management of a hazardous installation should report to appropriate members of the management of the enterprise all fatalities, all significant incidents (*i.e.*, accidents and near-misses), as well as other "reportable" events as determined within the enterprise.

- 14.c.3 The safety culture at an enterprise should promote, and all interested parties should encourage, reporting of accidents and near-misses to appropriate managers in the enterprise so that the causes of such incidents can be established.

  - Procedures should be in place for reporting incidents.

  - Employees should be given the appropriate training in hazard identification to facilitate reporting of incidents.

  - Reportable events should include those that occur in conjunction with work by (sub)contractors.

  - Efforts should be made to foster an environment where reporting incidents and discussing them are considered to be positive activities.

  - Employees should also be encouraged to discuss near-misses among themselves, with their representatives, and with their management immediately after they happen.

  - Employees should be given the assurance that there will be no adverse repercussions for reporting incidents to management or discussing incidents among themselves or with their representatives.

- 14.c.4 Information on incidents should also be provided to relevant trade associations.

- 14.c.5 Efforts should be made to co-ordinate reporting by industry at national and international levels in order to facilitate information sharing.

Chapter 15

INCIDENT INVESTIGATIONS

a. GENERAL PRINCIPLES

These General Principles apply to investigations by both industry and public authorities. Investigations by different parties may have different objectives (for example, public authorities might be doing an investigation for purposes of enforcement). Nevertheless, investigations by industry and public authorities have a number of common elements, in particular with respect to methodologies to be used.

(*See text box after para.* 15.*a.*1 *on incident investigations*)

15.a.1 Management should investigate all incidents involving hazardous substances at their installations. Public authorities should investigate accidents with significant adverse consequences.

- The objectives of industry-initiated investigations and of investigations by public authorities will be different (see sections (b) and (c) below). However, many of the principles of how to conduct an investigation will be similar, as described in this part (a).

- Generally, industry-initiated investigations will be conducted separately from those initiated by public authorities, although joint investigations are desirable.

INCIDENT INVESTIGATIONS

An investigation should be a fact-finding activity to learn from experience, not an exercise designed to allocate blame or liability. Those involved should be reassured of this. There should be full co-operation between the operational staff at the installation and those involved in the investigation.

The emphasis in conducting investigations should be on identifying the underlying causes (sometimes called the "root" causes) in a chain of events leading to an accident, the lessons to be learned, and ways to prevent similar accidents in the future. The investigation should not be limited to determining the immediate or apparent cause(s).

It should be recognised that accidents are generally the final stage of a long sequence of events in which there is a complex interplay between technical defects, human error and insufficient organisation/management.

Where "human error" is involved, the cause should not simply be so recorded. Rather, investigators should determine exactly what elements contributed to any human error. Such elements could include, *e.g.*, boredom, stress, overwork, or insufficient training. Other root causes could be: the system was not sufficiently error-tolerant; the operating procedures were not made available in written form or were not kept up-to-date; the procedures were not realistic, created difficult circumstances, or called for illogical actions by the operator; there was poor ergonomic or system/technology design; the process design did not provide the operator with enough data or provided too much data to expect an appropriate response; staffing was insufficient; there was undue pressure on the operator or manager to sacrifice safety to higher productivity; or a reorganisation or a change in staff was not properly managed.

.../...

INCIDENT INVESTIGATIONS (*cont.*)

Human errors are not limited to operator errors but may occur at different points in the hierarchy of the enterprise including, for example, at the level of those responsible for maintenance, management of change or permit to work systems, or at the level of supervisors and management. Examples of human failures, in addition to operator errors, can involve: problems with transmission of knowledge, especially when experienced specialists retire; the complexity of the system, including process design and engineering; the ageing of plants and related repairs, without adequate maintenance and inspection; and the need to cope with changes in organisation or technology, including automation.

The procedure for root cause investigations of accidents should be systematic, thorough and fair. The procedures should consist of four main phases:

- The first phase is before there is access to the accident site, when a number of steps can be taken to further the investigation including: organising the investigation team; interviewing eyewitnesses; organising an information and tracking system; organising lists of factors which might have influenced the event; developing the preliminary list of scenarios; co-ordinating with the emergency response team to ensure preservation of evidence; undertaking investigations outside the restricted areas; preparing for large volumes of information; and taking aerial photographs.
- The second phase consists of the initial site visit, when it is important to document the condition of the site, revise investigation plans, and identify time-sensitive evidence.
- The third phase is during the ongoing investigation, when the focus will be on recovery of evidence, reconstruction, analysis, testing and simulation of scenarios, and systematically affirming or denying scenarios.
- The fourth phase involves preparation of the investigation report and recommendations, which should be completed in a timely manner to avoid delays in the application of improvements.

In designing and implementing root cause investigations, efforts should be made to address possible constraints, or challenges, to conducting effective investigations, such as:

- the destruction or deterioration of evidence by possible memory distortion of witnesses over time, and the fact that the investigation occurs under stressful circumstances and may last for a number of months;
- limiting the possible scenarios examined, and thereby biasing the collection of evidence to try to match the chosen scenarios;
- laws designed to promote public access to information, as well as laws to protect confidential business information, that can present hurdles to the collection and sharing of relevant evidence;
- constraints due to limited financial or human resources available, relative to the complexity of the investigation;
- insufficient trust among parties involved;
- liability issues; and
- actions taken to make the site safe.

The use of a computer database for storing the key elements of incidents can facilitate their analysis. Particular trends can be highlighted and historical data can be used proactively in accident prevention, for example by orienting safety training towards the avoidance of the type of incidents that have occurred.

Key elements of root cause investigations

(*See text box above*)

15.a.2 Protocols should be established for conducting root cause investigations. The protocols should, *inter alia*, identify the roles and responsibilities of the individuals involved in the investigation. The protocols should also specify the steps in the investigation process.

- The objectives of root cause investigations should be to:
  - discover what happened;
  - determine why the incident(s) happened (*i.e.*, what were the underlying cause(s), contributing cause(s) and chain of events);

- develop plans for corrective action to be taken by management in order to prevent related or similar incidents; and
- implement the plans.

⏩ In this regard, after the first step (identify what happened), it is important to keep asking "why" until the underlying or root causes are determined.

⏩ The protocols should also identify the appropriate point for stopping the investigation to help ensure that it is not stopped prematurely. For example, as a general matter, the failure to follow procedures should not be considered a root cause; there needs to be a deeper consideration of what caused this failure. Furthermore, the event itself cannot be considered a root cause (*e.g.*, the fact that an explosion occurred cannot be considered the root cause of the release of hazardous substances).

■ 15.a.3 A team should be established for an accident investigation.

⏩ The team should have a diverse membership with participants from different disciplines, with different skills, including members with knowledge of the specific installation subject to the investigation. These could be employees involved with the operation and maintenance of the installation and their representatives.

⏩ All members of the investigation team should have the appropriate knowledge, competency and experience to carry out investigations and to fulfil their identified roles and responsibilities.

■ 15.a.4 Investigations should take account of the various types of information/evidence[5] that might be available, including testimony from humans (*e.g.*, witnesses), documentation (from on or off-site including, maintenance, laboratory, sampling and meteorological records), and physical evidence (*e.g.*, from the accident scene and from related equipment).

⏩ To the extent possible, evidence should be protected in order to facilitate the investigation process. There is a need to identify and secure all time-sensitive evidence, and to take steps to maintain a chain of custody for all evidence. There should be clear identification of who has responsibility for evidence and who can release evidence.

⏩ In this regard, emergency response teams should be trained to understand how to maximise evidence integrity.

⏩ There should be effective safeguards for the protection of confidential business information that might be revealed during an investigation, and all members of the investigation team should be made aware of these safeguards and understand how they should be applied.

■ 15.a.5 Investigation reports should be prepared and should include, *inter alia*, a factual chronology of the events leading up to the accident/near-miss, a statement of the underlying (or root) causes and contributing causes, and recommendations for follow-up actions. The report should also document which theories about causes of the accident are not correct and why.

■ 15.a.6 The recommendations from investigations should be specific, so that these can lead to corrections of technology or management systems. Generally, an investigation will lead to multiple recommendations for actions to be taken (*i.e.*, no individual action will usually be sufficient). In this regard, the objective should be to seek optimum solutions under the circumstances, recognising that it might not be possible to achieve perfect solutions.

■ 15.a.7 There should be adequate follow-up to an investigation in order to verify that corrective actions have been taken, that they were implemented as intended, and that they fixed the problems identified.

- 15.a.8 Consideration should be given to the use of third parties, such as consultants, to evaluate the findings from an accident investigation and help ensure the quality of the investigation results as well as the recommendations set out in the report.

- 15.a.9 To the extent that there is more than one body with the authority to investigate an accident, efforts should be made to co-ordinate the investigations to avoid duplication, improve effectiveness and help ensure access to all relevant evidence.

- 15.*a*.10 Following an investigation, there should be a review of the investigation process to help ensure that it has been effective, that there has been appropriate follow-up of its results, and to learn for future investigations. In this regard, it can be very helpful to involve "outside" parties in the review process (including, for example, consultants or experts from industry associations).

Sharing the results of investigations

(*See paras.* 15.*b*.3 *and* 15.*c*.3)

- 15.*a*.11 Efforts should be made to promote sharing of the lessons learned from investigations of incidents and to facilitate communication as quickly as possible (for example, by using technology such as the Internet).

  - It should be recognised that it may not be enough to simply publicise "lessons learned"; efforts should be made to understand how to communicate the information in a way that will result in appropriate actions being taken. In this regard, "lessons learned" can form an extremely important part of education and training programmes.

  - Efforts should be made to identify barriers to sharing information about investigations and lessons learned (including, for example, possible concerns about legal issues and protection of confidential business information), and to find ways to minimise these.

- 15.a.12 Relevant information from investigation reports (*e.g.*, recommendations and lessons learned) should be shared among stakeholders who may be affected by the outcome (*e.g.*, users of related technology), with due regard for the protection of confidential business information. Sharing the lessons learned will help to ensure that they will be taken into account at all relevant facilities and by all relevant personnel.

  - Management should share relevant aspects of the investigation reports as widely as possible with public authorities and other interested parties in order to improve safety and to inform the public. It is in the best interest of all parties to make the relevant aspects of the investigation reports publicly available, to the extent possible. Such reports can also be used in support of education and training activities.

  - Enterprises should seek to share key information about lessons learned through available national and international databases or clearinghouses.

  - Mechanisms should be developed to help ensure that enterprises that do not have access to regular channels of safety information (*e.g.*, through industry associations) receive relevant information concerning the experience of other enterprises.

  - Public authorities should facilitate the sharing of reports within industry. In this regard, they should consider developing databases related to incidents (accidents and near- misses) so that enterprises can easily get access to this information (*e.g.*, via the Internet).

- 15.a.13 Efforts should be made to improve sharing experience related to the methodologies and approaches used in investigations of incidents.

- 15.a.14 Efforts should be made to develop a basic agreed framework and use of a common terminology for preparing investigation reports in order to facilitate sharing information related to investigations.

b. INDUSTRY

- 15.b.1 Management of a hazardous installation should ensure that there is a prompt investigation and thorough analysis of all incidents involving hazardous substances.

  - Management of hazardous installations should adopt internal standards establishing clear guidance concerning the nature of the investigations that should be carried out, the individuals who should be involved, and the criteria to be used to determine the extent of investigations for different types of incidents.

  - Incidents (including accidents and near-misses) that have greatest potential for leading to improvements in chemical safety should be subject to the most intensive investigations. Cases with limited potential for learning lessons should be subject to more limited investigations.

  - Investigating near-misses is important, since they are often precursors to accidents, and can identify actions that can be taken to avoid accidents. In addition, near-miss investigations engage employees and help to distribute responsibility for safety. To improve understanding of near-misses, a near-miss first needs to be identified (*e.g.*, by an employee), and then this fact needs to be disclosed/reported to appropriate parties. Management should encourage the identification and disclosure of near-misses by establishing an atmosphere of trust, where employees do not fear being blamed, and by sending consistent messages to all employees regarding the importance of such disclosures. Furthermore, the procedure for disclosing/reporting near-misses should be relatively simple.

  - Investigations (either internal or third-party) should involve individuals who have the authority and the resources to take any corrective actions suggested by the investigations.

  - Investigations should be documented, and the reports published, to inform other relevant stakeholders of the lessons learned in order to improve safety of hazardous installations.

- 15.b.2 Management should be committed to doing root cause investigations in order to learn lessons that can lead to improved safety.

  - An appropriate level of resources should be provided for such efforts and for taking the corrective actions recommended in investigation reports.

  - Root cause investigations should be taken at least to the point of determining the cause(s) which, if corrected, will prevent the recurrence of events that could lead to the same or a similar accident/near-miss.

- 15.b.3 Management should share the results of investigations of accidents and near-misses (including recommendations and lessons learned) throughout the enterprise, with other enterprises, and with other relevant stakeholders, in order to help avoid the same, or similar, problems in the future.

  - It is important that the lessons learned be provided throughout the enterprise (to management as well as labour and their representatives) and in particular to other installations within the enterprise that might face similar situations.

- The lessons learned should be provided to those in a position to implement changes, in accordance with recommendations contained in the investigation report. There should be a commitment throughout the enterprise to take actions in light of the recommendations and the lessons learned.

- Investigation reports and lessons learned from incidents should be appropriately stored and easily retrievable. This should help maintain corporate memory over time, even when critical staff leave.

- All new employees should receive training that includes relevant aspects of, and lessons learned from, accidents and near-misses that have occurred related to their enterprises' activities.

- The results of the investigation should be made available to other enterprises that could benefit from the information to improve safety (*e.g.*, enterprises with installations similar to the one where the incident occurred).

- The dissemination of information from investigation reports should be done through established procedures, including a means for tracking information flows and follow-up.

(*See paras.* 15.*a*.11 – 14)

15.b.4 Management should proactively seek out, and utilise, relevant experience of other enterprises with respect to investigations. Information concerning such experience may be available in, for example, accident reports on the websites of enterprises, through national and international databases, and in other accessible sources of information.

c. PUBLIC AUTHORITIES

15.c.1 Public authorities should independently investigate all accidents with significant adverse effects to health, the environment or property, as well as other accidents that have the potential to provide significant insights for reducing risks. This should be done as part of the authorities' regulatory authority to determine the underlying (or root) causes and contributory causes of accidents.

- Public authorities should also consider initiating an investigation if it is suspected that a law or regulation has been violated.

- Investigations should be documented, and relevant information from the reports should be published, to inform other relevant stakeholders of the lessons learned so that the safety of hazardous installations can be improved.

- Investigations carried out by public authorities should be unbiased and trustworthy so that the public can have confidence in the outcomes.

- Where appropriate, an accident investigation should be conducted by a group of experts that includes different individuals than those responsible for inspection of the installation and enforcement of the control framework (for example, a specially designated commission).

- All appropriate interested parties should have an opportunity to be involved in the investigation.

- Public authorities should be responsible for ensuring that appropriate action is taken in light of the recommendations set out in investigation reports.

- 15.c.2 Public authorities should establish the criteria by which they will determine priorities for investigations (*i.e.*, which accidents should be investigated and to what extent), taking into account resource constraints.

  - The selection criteria should be chosen to maximise benefits (*e.g.*, in terms of lessons to be learned), make most effective use of resources, and allow for timely action and results.

  - In this regard, public authorities should consider such factors as the history of similar accidents, the extent of damage to health and the environment, the number of facilities that use the process(es) involved in the accident, and the likelihood that new information will result in improvements in safety. In addition, consideration should be given to policy interests, such as level of public concern.

- 15.c.3 Investigation reports prepared by public authorities should be published, for as wide dissemination as possible, with modifications necessary to protect confidential information.

  - The reports should include sufficient background information to enable the investigation results to be useful in other situations.

  - The reports should include conclusions resulting from the analysis of accident data.

  - Public authorities should disseminate such reports to the industrial organisations within their country that might benefit from the lessons learned from the investigation.

  - A mechanism should be developed to facilitate the sharing of investigation reports in an international context and, in particular, to improve information sharing concerning causes of accidents.

  - Public authorities are in a unique position to correlate information from investigation reports, foster exchange of information, and provide credible analyses. Such information is important to both public authorities and management of hazardous installations to improve decision-making (for example, with respect to development and implementation of regulations, monitoring, preparation of emergency plans, and development of risk assessment and management techniques).

(*See also paras.* 15.*a*.11 –14)

- 15.c.4 Adequate resources should be provided to public authorities to carry out their responsibilities with respect to accident investigations and dissemination of related information.

- 15.c.5 Where more than one agency (national, regional and/or local) is involved in investigations, efforts should be made to co-ordinate the activities of these agencies.

  - Such co-ordination will maximise the ability of witnesses to provide useful information, reduce disruptions in operations, improve fairness, ensure consistency of evidence obtained from samples, and improve the effectiveness of the investigations.

  - Co-ordination and collaboration need to be discussed, and agreed on, prior to the initiation of the investigation. The different objectives of the different agencies should be taken into account in developing mechanisms for co-ordination.

d. OTHER STAKEHOLDERS

- 15.d.1 Community representatives should be involved in debriefing and accident investigations, as well as reviews of investigation reports, as appropriate, to help reduce the likelihood of similar accidents occurring in the future and to help improve preparedness and response efforts. A number of other parties can also help improve the sharing of lessons learned from accident investigations. For example, technical and professional organisations, academic institutions, and other non-governmental organisations should be involved in the dissemination of relevant information.

- 15.d.2 When insurance companies undertake investigations of accidents, the results of these investigations should be made available to the enterprise concerned and to other enterprises, to the extent possible.

NOTES

1. See OECD Council Recommendation C(89)88(Final).

2. As noted earlier, several national and international projects are underway to improve understanding of the health effects of acute exposure to specific chemicals. These include, for example, the AEGLs project initiated by the US and now including several European countries and the EC ACUTEX project. These projects aim to develop innovative approaches to define acute exposure levels that could be used for developing acute exposure levels for emergency planning and land-use planning.

3. The World Health Organization is engaged in work related to such information sharing.

4. There are international schemes for sharing accident case histories and statistics. In particular, the MARS database ("Major Accident Reporting System") managed by the European Commission's Major Accident Hazard Bureau (MAHB) collects accident reports from European Union countries. In addition, the MARS system is being used to manage the accident reporting scheme developed by the OECD, as well as the one developed by UNECE.

5. Evidence can be defined as "any items needed to evaluate scenarios and support analysis."

Part E

SPECIAL ISSUES

This Part supplements Parts A – D of the Guiding Principles by providing additional, specific guidance related to:

- *transboundary/international concerns, including transboundary co-operation, international assistance, and transfer of technology and international investments (Chapter 16); and*

- *transport involving fixed facilities, i.e., fixed installations involved in the transport of hazardous substances such as transport interfaces (including port areas) and pipelines (Chapter 17).*

Each of these two Chapters is further described below.

Chapter 16

TRANSBOUNDARY / INTERNATIONAL ISSUES

This Chapter addresses a number of issues concerning the relationship between different countries including, for example, cross-border co-operation relating to hazardous installations near boundaries, as well as bilateral and multilateral assistance concerning chemical accident prevention, preparedness and response. In addition, it addresses the transfer of technology and international investments in technology associated with hazardous installations.

This Chapter also addresses the role of intergovernmental organisations in the field of accident prevention, preparedness and response (see text box after para. 16.b.15).

The Chapter is based on the premise that all hazardous installations, irrespective of where they are located, should achieve a similar level of safety and that all the provisions of the Guiding Principles apply to hazardous installations worldwide. However, it is recognised that the full implementation of the Guiding Principles may not be possible in all communities due to limited human and financial resources, lack of information, or an insufficient legal framework.

This Chapter also takes into account the special role of more developed countries, due to their experience with respect to chemical accident prevention, preparedness and response. Therefore, means should be found to facilitate the transfer of information and know-how to countries that do not have the same level of knowledge or experience in this area.

In this respect, assistance to developing countries, and countries with economies in transition, should be consistent with ecologically sound development; efforts should therefore be made to minimise the possibility that assistance projects, or transfers of technology, will cause unreasonable risks of chemical accidents.

This Chapter builds on international agreements (such as the UNECE and ILO Conventions), as well as on guidance materials developed by UNEP, OCHA, WHO, OECD, EC and others.

a. TRANSBOUNDARY CO-OPERATION

16.a.1 Neighbouring countries should exchange information, and consult each other, with the objective of preventing accidents capable of causing transboundary damage and reducing adverse effects should such an accident occur.

- To this end, a country where a hazardous installation is located or planned ("host country") should provide to all potentially affected countries relevant information concerning existing or planned hazardous installations, and the potentially affected countries should provide the host country relevant information concerning the area under its jurisdiction that could be affected by transboundary damage in the event of an accident.

- Information that the host country should provide, to the extent it is available in accordance with domestic law, includes:
  - the location and general description of the hazardous installation capable of causing transboundary damage;
  - common names or, if more appropriate, the generic names or general danger classifications of the hazardous substances that may cause transboundary effects;

- the legislative, regulatory and administrative requirements under which the installation operates;
- general information concerning the nature, extent and likely off-site effects of an accident on health, environment or property; and
- information on the relevant aspects of the off-site emergency plan.

⏩ Public authorities in potentially affected countries should provide the following information to public authorities in the host country:

- distribution of population, including sensitive groups;
- location and general description of properties and activities that could be adversely affected; and
- location of natural resources, protected areas, sensitive environments and historical monuments that could be damaged.

■ 16.a.2 With respect to land-use planning for proposed hazardous installations capable of causing transfrontier damage in the event of an accident, a policy concerning the exchange of information and consultation between competent public authorities of neighbouring countries should be applied consistent with the UNECE Conventions on Transboundary Effects of Industrial Accidents and on the Protection and Use of Transboundary Watercourses and International Lakes, as well as with the OECD Council Decision C(88)84(Final).

■ 16.a.3 Neighbouring countries should consult one another with a view to co-ordinating off-site emergency planning related to hazardous installations capable of causing transboundary damage.

⏩ They should inform each other of the communications systems to be used, the main features of their emergency plans and the means available for emergency response in the event of an accident causing transboundary damage.

⏩ They should inform each other of the instructions given to their respective populations on how to respond in the event of an accident.

■ 16.a.4 Neighbouring countries should establish procedures for the rapid and effective transmission of information related to an accident (or imminent threat of an accident) that might cause transboundary effects, and should set up systems for communication of pertinent information following an accident.

⏩ The countries concerned should notify each other of the identity and details of the authorities responsible for transmitting or receiving information, and the authorities responsible for implementing the off-site emergency plans.

⏩ The countries concerned should co-operate in ensuring that the potentially affected public receives the same information, whether they are in the host country or in neighbouring countries.

⏩ Public authorities receiving information about hazardous installations should respect the confidentiality of any information received. They should not make available to the public information that is not publicly available in the country supplying it.

■ 16.a.5 In the event of an accident involving hazardous substances (or imminent threat of an accident) capable of causing transboundary effects, public authorities in the host country should ensure that appropriate authorities in potentially affected countries are notified without delay and are given appropriate information. In addition, the host country should endeavour to co-ordinate response measures with affected countries. The information that should be provided by the host country to potentially affected countries should address, *e.g.*:

- accident location and brief description of the circumstances;
- immediate effects of the accident;
- emergency measures planned and actions taken;
- chemical identity, quantity and physical form of the hazardous substances that may affect the potentially affected countries; and
- data available for evaluating the probable impacts of the accident.

16.a.6 Representatives of potentially affected countries/communities should have an opportunity to participate in licensing or siting procedures for hazardous installations that might have transboundary effects in their countries.

16.a.7 To the extent practicable, public authorities should attempt to provide assistance to other countries that have requested help related to the preparedness for, or response to, accidents involving hazardous substances.

16.a.8 Public authorities should develop procedures to facilitate the transit through their territory of personnel and equipment to be used for mutual aid in the event of an accident involving hazardous substances.

16.a.9 Public authorities should facilitate the exchange of technology related to the prevention of, preparedness for, and response to chemical accidents.

b. BILATERAL AND MULTILATERAL TECHNICAL AND FINANCIAL ASSISTANCE

General principles

16.b.1 Technical co-operation should be strengthened between more developed countries and "recipient countries" (*i.e.*, developing countries and countries in economic transition ["CEITs"])[1] in order to increase the institutional capability of governments in recipient countries to fulfil their roles and responsibilities with respect to the safety of hazardous installations. Such technical co-operation could address, for example, assistance related to establishing accident prevention programmes, undertaking emergency planning, responding to an accident, and facilitating assistance should an accident occur.

16.b.2 All donor and recipient countries should seek to improve effectiveness in the delivery of assistance programmes.

- To be most effective, assistance programmes should:
  - be responsive to specific, well-defined needs (*i.e.*, be "demand driven") and be results oriented;
  - utilise local experts and local languages;
  - take into account a long-term perspective; and
  - include the active participation of all relevant stakeholders, *e.g.*, public authorities, industry (including labour), and community organisations.
- All programmes should be well-planned, with sufficient allocation of resources (human and financial) to permit appropriate follow-up activities.
- Existing guidance and training materials should be used, to the extent possible, and relevant documentation should be made widely available.
- At an early stage, efforts should be made to define the objectives of assistance programmes, the target audiences and the appropriate range of participants.

- All relevant stakeholders should be involved from the planning stages, to secure the commitment of the stakeholders and to ensure that participation is appropriate for the particular activity.

- Participants in assistance programmes should play an integral role in the development, implementation and follow-up of assistance activities.

16.b.3 Donor and recipient countries and organisations should take action to improve information-sharing and co-ordination, and to increase transparency and accountability, in order to eliminate any redundant activities and to increase the effectiveness of all programmes.

- Such action would permit organisations/countries to make better use of resources and to draw on their particular strengths.

- This would allow donor countries to target assistance programmes more effectively to priority areas (*i.e.*, make the assistance more demand driven) and to involve all relevant stakeholders in assistance activities.

- This action would also permit the recipient organisations/countries improved access to, and use of, available programmes and materials while reducing confusion due to possibly conflicting messages from different organisations.

- This would result in a better use of time and resources of participants, more effective projects and outputs utilising expertise from a wider variety of sectors than would be possible with separate efforts, and elimination of conflicts over what constitutes the "best" guidance.

- To achieve increased transparency and co-ordination, focal points and co-ordinating mechanisms should be created in and among donor and recipient countries and international organisations. These mechanisms should include, *inter alia*: regular exchanges of calendars of events; regular updating and distribution of inventories of technology available (or planned) for accident prevention, preparedness and response; and careful consideration of projects' mandates, activities and objectives, including their particular strengths and limitations.

- Projects should be referred to the most appropriate lead agencies and, where appropriate, joint and/or co-operative activities should be undertaken.

- To the extent possible, use should be made of existing co-ordination mechanisms such as the Intergovernmental Forum on Chemical Safety (IFCS) and the Inter-Organization Programme for the Sound Management of Chemicals (IOMC).

Role of aid agencies (national and multinational)[2]

16.b.4 Bilateral and multilateral aid agencies, and related institutions (collectively called "aid agencies"), should help developing countries and CEITs to minimise the risk of accidents involving hazardous substances, through development assistance projects.

- Technical assistance and training should be provided to build institutional infrastructures, develop human resource capabilities, and increase the institutional capability of developing countries and CEITs. This would help public authorities in recipient countries fulfil their roles and responsibilities related to the safety of hazardous installations, including prevention, preparedness and response to accidents.

- Aid agencies should ensure that assistance projects do not increase or sustain unreasonable risks of accidents involving hazardous substances.

- 16.b.5 Aid agencies should screen relevant aid proposals to minimise the possibility that projects will help create, increase or sustain an unreasonable risk of an accident involving hazardous substances. Rather, relevant projects should further the objective that hazardous installations in developing countries and CEITs meet a level of safety equivalent to that of similar installations in more developed countries.

  - Aid agencies responsible for initiating aid proposals should be sensitive to issues of safety with respect to such proposals.

  - The team within an aid agency responsible for developing aid proposals should, as appropriate, include specialists with the background, training and experience necessary to consider the potential safety consequences of any proposals relating to hazardous installations.

  - Aid agencies should use formal and explicit procedures to assess potential risks of accidents when decisions are being taken concerning technical and financial assistance in connection with specific hazardous installations. The assessment should take into account, among other things: potential technical failures; management capability; workforce capability; appropriateness of the technology for the local community; and the institutional arrangements for oversight, emergency preparedness and response. The results of these assessments should be made available to officials in the aid recipient countries and to local community groups.

  - When undertaking the formulation, assessment and implementation of aid projects relating to hazardous installations, input should be sought from local residents in recipient countries, including community leaders, in order to benefit from their knowledge about the special attributes and limitations of the local community (infrastructure, workforce capability, cultural considerations, *etc.*).

- 16.b.6 Funding allocations from aid agencies related to hazardous installations should ensure that sufficient resources are available for safety-related issues, such as education and training. Consideration should be given also to incorporating arrangements and funding for adequate monitoring, evaluation, maintenance and other follow-up to ensure that essential safety requirements are being met.

- 16.b.7 When financing industrial and other development projects involving hazardous substances, aid agencies should ensure that emergency medical facilities, and medical information, are available for treatment of potential injuries in the event of chemical accidents. Such agencies should be encouraged to help develop the capacity of recipient countries (*e.g.*, through financing) to provide adequate medical response to accidents involving hazardous substances.

- 16.b.8 Aid agencies should provide information, technical education, training and assistance to promote safety of hazardous installations at the local level.

  - This assistance should address, *e.g.*, siting and land-use policies to avoid the encroachment of populations in the vicinity of hazardous installations, and the application of international agreements and guidance documents, such as those developed by UNEP, ILO, WHO, OCHA, UNECE, and the OECD.

  - Intergovernmental organisations, as well as industry and trade unions and their international organisations, should assist with such technical co-operation.

- 16.b.9 Aid agencies, industry associations and enterprises in developed countries should assist developing countries and CEITs to identify appropriate sources of technical and financial support for activities related to accident prevention, preparedness and response.

- 16.b.10 Organisers of assistance programmes should critically review their work programmes on a regular basis to help ensure that they remain as effective as possible and make efficient use of available resources.

  - The review should consider, for example: the overall effectiveness of the programmes; what tools or instruments are available to support the programmes; whether there are advantages in the use of different approaches; whether the programmes continue to address the priority needs of the target audience and take into account their specific conditions; and how the organisation of the programmes and co-ordination with other programmes can be improved to more effectively and efficiently deliver projects that are wanted and can be used in practice.

  - Regular review can foster accountability and provide a basis for determining whether there have been lessons learned which could improve future activities.

  - Aid agencies should be prepared to recognise that certain projects (including proposals for new projects and on-going activities) may not always be appropriate. This might be because, for example, the project is not appropriate for a given location, there is another donor that is better suited to provide the assistance, or because the project is not a priority for the recipient country.

- 16.b.11 Sector-specific networks should be improved, and better utilised, in order to facilitate the exchange of information among experts, to develop co-operative programmes (for example, among research institutes) and to provide for an exchange of inspectors or other specialists.

Role of multilateral financial institutions

- 16.b.12 Multilateral financial institutions (*e.g.*, World Bank, regional development banks) should develop and apply policies and procedures for minimising the risk of accidents at hazardous installations that they help to finance. For example, they should not assist with any project that poses an unacceptable risk of an accident involving hazardous substances.

  - In this regard, an adequate assessment of accident potential, consistent with these *Guiding Principles*, should be carried out before multilateral financial institutions provide financing for new hazardous installations or the expansion of existing installations.

  - In addition, these institutions should help developing countries and CEITs, as appropriate, to undertake an analysis of risks of existing installations and help to develop education and training programmes concerning accident prevention, preparedness and response.

- 16.b.13 Multilateral financial institutions should inform governments in recipient countries whenever proposed projects would create, increase or sustain risks of an accident involving hazardous substances, and the financial institutions should provide any available information concerning these risks.

- 16.b.14 Multilateral financial institutions should promote appropriate safety practices on the part of enterprises which receive financial assistance in connection with transferring technology that has the potential to be involved in an accident involving hazardous substances. Such safety practices can be promoted by actively encouraging the enterprises to follow these *Guiding Principles*, and by taking into account - when determining the level of financial assistance - the resources the enterprises would need to follow the *Principles*.

Role of intergovernmental organisations

- 16.b.15 Intergovernmental organisations and their member countries should critically appraise the needs of potential recipient countries before creating new bodies/programmes. They should

take into account possible duplication of effort and consider whether another group might be better placed to carry out the proposed work.

THE ROLE OF INTERGOVERNMENTAL ORGANISATIONS

Intergovernmental organisations have an important role to play in influencing and assisting in the implementation of sound chemical management practices, such as those outlined in these *Guiding Principles*, and in encouraging the use of, and facilitating access to, tools and guidelines to help in this process. In particular, intergovernmental organisations can serve as a link between developed and developing countries/CEITs, to share lessons learned, and to ensure that countries are able to take appropriate advantage of the many technical resources and expertise that exists in the area of chemicals management. In particular, intergovernmental organisations can:

- broker information and assistance between donors and recipients;
- mobilise and co-ordinate international assistance for those facing emergencies, particularly when domestic capacity is exceeded and/or neutral and independent assessments are required;
- supplement bilateral and multilateral arrangements, where gaps exist (*i.e.*, provide an international safety net);
- support and/or implement capacity building projects (at local and regional levels);
- encourage and support the further development of procedures and tools for implementing relevant guidance;
- co-ordinate multilateral assistance to ensure that needs are met and that duplication is avoided;
- facilitate co-operation, collaboration, assistance, financial support, and access to technical expertise;
- raise awareness concerning the importance of instituting appropriate programmes and tools that already exist to facilitate this;
- support and sponsor application and adaptation of programmes and tools for use in developing countries;
- undertake or sponsor global reviews of safety performance;
- ensure appropriate international stakeholder involvement in prevention, preparedness and response initiatives;
- facilitate technology transfer to those in greatest need (between developed and developing countries); and
- provide a practical link with industry and professional organisations to promote greater use of international guidance materials and health, safety and environment systems by industry, and to facilitate the international standardisation of reporting and management systems and tools.

AWARENESS and PREPAREDNESS FOR EMERGENCIES AT LOCAL LEVEL

Assessment of the circumstances surrounding various industrial accidents - such as Bhopal (India) in 1984, several LPG explosions in Mexico City in 1984, the Sandoz warehouse fire near Basel (Switzerland) in 1986, the Enschede (Nertherlands) fireworks explosion in 2000 and the Toulouse (France) explosion in 2001 - has led to the conclusion that a higher degree of awareness and preparedness by the general public near these facilities would have lessened the harmful impacts of such accidents.

APELL ("Awareness and Preparedness for Emergencies at Local Level") has been developed by UNEP as a tool to minimise the occurrence and harmful effects of technological accidents and emergencies by raising awareness of local communities and by improving the communication between parties. It provides a well-structured, detailed process for developing a co-ordinated, integrated and well-functioning emergency response plan for local communities.

For more information about APELL, see: http://www.uneptie.org/pc/apell/home.html

Role of recipient countries

- 16.b.16 Public authorities should recognise, when requesting bilateral or multilateral aid related to hazardous installations, that appropriate laws and procedures should be in place (such as those described in these *Guiding Principles*) and should be implemented.

  - Public authorities in recipient countries should take whatever steps are necessary to co-operate with aid providers to help ensure the safety of hazardous installations, for example, by providing information to support assessments and the implementation of aid projects.

  - All public authorities with responsibilities related to requesting aid, or to improving chemical accident prevention, preparedness and response, should co-ordinate their activities to help ensure the most effective and efficient use of technical and financial assistance.

- 16.b.17 Public authorities should maintain records of their experience as recipients of bilateral or multilateral aid related to hazardous installations. They should share their experience in this regard with donor organisations and other aid recipients.

- 16.b.18 Public authorities should facilitate the dissemination of these *Guiding Principles*, and other relevant guidance materials, to all stakeholders including public authorities at all levels, industry including labour, community groups, and other interested organisations. Public authorities should also undertake to help these parties understand and implement these guidance materials.

c. TRANSFER OF TECHNOLOGY AND INTERNATIONAL INVESTMENTS

This Section recognises that public authorities should not discriminate - with respect to safety issues - between hazardous installations managed by domestic enterprises and those that involve foreign enterprises, imported technology or foreign investments.

This text is not meant to be comprehensive in addressing technology or investment flows from developed to other countries. Rather, it is meant to illustrate the types of issues that should be taken into account, as well as the need (in some cases) to redefine the respective roles and responsibilities of industry, public authorities and others in order to achieve the desired level of safety.

While these Principles are drafted in terms of technology or investment flows from developed countries to developing countries or CEITs, they also apply to other transfers of technology/investment (for example, from one developing country to another).

The application of these Principles should facilitate the transfers of technology and investments since technology suppliers and potential investors may be reluctant to deal with recipient countries/companies without an understanding of the ability and willingness of the recipients to operate hazardous installations safely. Recipient countries/companies will also be reluctant to accept technology that cannot be operated safely.

This Section incorporates text developed within the context of the UNEP APELL programme, with respect to the roles and responsibilities of recipient countries/industry.

General principles

- 16.c.1 All parties should promote a level of safety for hazardous installations in all countries that is equivalent to that for similar installations in developed countries.

  - Equivalent level of safety does not preclude the public authorities or enterprises from seeking to achieve a higher level of safety.

- The degree of safety of installations which involve an investment or transfer of technology from a developed country should be the highest level of safety reasonably practicable according to the current state of knowledge and local circumstances.

- The transfer of technology, or the investment, should only take place once there is reasonable assurance that safe operating conditions can be achieved.

- Good design, engineering, construction, operational procedures and management practices should be followed at the installation so that safety is maintained on a continuing basis. The need for education and training, and for provision of information concerning the installation, should also be taken into account.

- Responsibilities, including costs, associated with meeting the safety objectives may be allocated by agreement among the parties concerned.

16.c.2 When an enterprise based in a developed country invests in a new hazardous installation in a developing country or CEIT, or provides (transfers) process or other safety-related technology for such an installation, the process should be chosen and the installation should be designed to take into account local factors that may affect the safety of the installation. These include, among other considerations:

- geographical and climatic conditions;
- cultural and socio-economic factors;
- infrastructure, including emergency services;
- legal and administrative framework;
- land-use policies;
- local legal and control systems;
- local availability of labour;
- information systems; and
- available construction materials and equipment.

16.c.3 Technology suppliers and investors should, in conjunction with technology receivers and relevant public authorities, prepare a site-specific hazard assessment that includes, among other things, an evaluation of the culture and practices in the recipient country that may prompt a re-design of the safety engineering system, and an evaluation of the potential impacts of any design assumptions that may affect the safe use of the technology at the specific location.

- These might include, for example, assumptions regarding the capacity and size of existing public emergency services, the reliability of steady electrical supply, the size of the pool of safety engineers, and the availability of spare parts and maintenance equipment.

- A hazard assessment should be used in deciding whether to go forward with a proposed technology transfer or investment.

16.c.4 All parties to a transfer of technology or an investment should agree on the division of responsibilities for the safe construction and operation of a hazardous installation. The enterprise receiving the investment or technology should ensure that the agreement provides for an adequate, continuing ability to operate and maintain the installation in a safe manner, and that it has the resources (including human, technical and financial) to carry out its responsibilities under the terms of the agreement.

16.c.5 The *Guiding Principles* relating to provision of information to employees and to the public should be applicable to all hazardous installations, irrespective of location, recognising however that the location of the installation may affect the relative roles of industry and public authorities.

- For instance, if local public authorities do not have adequate resources to implement public information schemes, the management of a hazardous installation should make relevant information available to the public, consistent with these *Guiding Principles*.

- The approaches used for risk communication in developed countries may not be able to be effectively transferred wholesale to other countries. To ensure that the information provided is accurate, comprehensive and understood, the approaches used should take into account local factors such as social and family structures, religious influences, language/dialect differences, resource limitations, and available information dissemination technology.

16.c.6 International organisations should continue to take action in support of the principle that transfers of technology and investments concerning hazardous installations should only take place when accompanied by the related safety technology and "know-how", together with the assurance that safe operating conditions can be achieved in the recipient country.

***Transfer of technology from developed countries to developing countries or countries with economies in transition* (CEITs)**

The following paragraphs concern the transfer of process or other safety-related technology by an enterprise based in a developed country to a hazardous installation located in a developing country or a CEIT. *The transfer of technology could be either: between independent parties; or within the framework of a relationship between companies.* In the latter *case, the relationship can range from minority participation to full ownership.* The *nature of this relationship may affect the allocation of responsibilities between the technology supplier and receiver, or may influence the means of carrying out their respective responsibilities.*

(*See paras.* 2.*i.*7 – 10 *on transfer of technology in general*)

16.c.7 The responsibilities of all parties involved in the transfer of technology related to a hazardous installation should be clearly defined at a preliminary stage of the transaction.

- There should be a written contract between the supplier and the receiver that specifies the duties of each with respect to the safety aspects of the technology being transferred, recognising that responsibility is linked to effective operational control.

- Such arrangements should take into account the amount of resources needed to comply with safety requirements, as well as relevant corporate Safety Policies and guidelines.

- Role of technology suppliers

16.c.8 The technology supplier should export only those technologies for which there is sufficient experience to permit an appropriate hazard analysis of the technology at the location where it will be used.

16.c.9 Transfer of technology related to hazardous installations should only take place if accompanied by the appropriate safety technology and the information necessary for the safe operation of the installation.

- The technology supplier should make available to the technology receiver and, on request, to competent public authorities in the importing country, the following information to the extent relevant to safety:

- national regulations, legal or administrative requirements, and accident prevention practices in the major areas where the technology is in use;
- generally accepted safety standards, voluntary codes, trade association rules, and other technical guidance documents relevant to the technology design, construction or operation;
- description of the process, including all necessary data on the substances handled, the chemical reactions involved, *etc.*;
- operating instructions and critical operating parameters during routine and non-routine conditions;
- a hazard analysis indicating, among other things, significantly hazardous features of the technology, known or suspected safety problems associated with the technology, possible products of runaways and domino effects during an accident, the minimum and maximum safe operating zones for each industrial process, and the normal quantities of hazardous, toxic and flammable substances present during processing or storage;
- any additional information relevant for hazard assessment and control, for the safe operation of the technology, for the safe handling of the hazardous substances used or manufactured, or for review of safety performance;
- directions for maintenance, including the recommended frequency of surveillance and maintenance of vital components and of the installation as a whole, estimates of prospective maintenance costs, and descriptions of monitoring equipment needed and skills required; and
- manuals and programmes for education and training of employees.

⏩ The above information should be available in an appropriate language and should be provided as early as possible and, to the extent appropriate and in accordance with the contract, before the transfer of technology takes place. The schedule for the provision of information should be acknowledged in the negotiation process for the transfer.

⏩ Appropriate arrangements should be in place to ensure the protection of legitimate trade secrets. The above in no way diminishes the intellectual property rights associated with the product or process that is the subject of the transfer of technology.

■ 16.c.10 The technology supplier should inform the technology receiver and, as appropriate, public authorities in the technology importing country, if the technology being transferred involves activities which are classified as hazardous in the supplier's country and/or, if known, in any third country.

■ 16.c.11 The technology supplier should be responsible for safe process design, supervision of commissioning, initial technical education and training, and start-up assistance, as well as for providing information needed for safe operation and safe handling of products used or manufactured (recognising that there should be a contract specifying the duties of the supplier and receiver in accordance with paragraph 16c.7).

■ 16.c.12 The technology supplier, through its own staff or consultancy services, should make technically qualified people available to the enterprise receiving the technology to assist with training and education regarding the safety of the technology, including the adaptation of the transferred technology to local conditions and its implementation in the local industrial infrastructure.

⏩ Such assistance should be made available during the design, construction, start-up and initial operation of the hazardous installation.

⏩ Specific contractual provisions can require the technology supplier to exercise control over some of the tasks that are normally the responsibility of the technology receiver, such as detailed engineering, plant construction, process operation, plant maintenance and modifications, alteration in design or operating procedures, provision of information to local authorities on

safety issues, training and supervision of the workforce, and the establishment of safety and security checking systems.

■ 16.c.13 The technology supplier should, as appropriate, continue to provide information and assistance necessary for the safe operation of a hazardous installation following start-up, although the extent of this responsibility and the period during which it applies can vary depending on the type and context of the specific contract. In all cases, the technology supplier should provide any relevant subsequent information related to safety that was not identified at the time of the transfer including, for example, information concerning an accident or near-miss involving related technology.

- Role of exporting countries

■ 16.c.14 Upon request by public authorities in the technology importing country, the public authorities in the technology exporting country should make available, to the extent reasonably practicable, the following information concerning a proposed or actual transfer of technology related to a hazardous installation:

- national and local legal and administrative requirements and regulations applicable to the location where the installation is sited and operated;
- government prepared information relevant to the risks, safe operation and intended purpose and use of the technology being transferred; and
- post-accident and incident review studies and reports that have been made available to the public, to the extent relevant.

⏩ Public authorities in the technology exporting country should be able to recover the costs of providing this information from the technology supplier, as appropriate.

⏩ Efforts should be made to develop an international mechanism for the collection, collation and dissemination of this type of information on a worldwide basis.

I*nvestments by enterprises based in developed countries in hazardous installations located in developing countries or countries with economies in transition* (CEITs)

The following paragraphs relate to international investments by enterprises based in developed countries in hazardous installations located in developing countries or CEITs. *This relationship can take different forms, i.e., the hazardous installation is under the actual control of the enterprise based in the developed country (subsidiary relationship) or the enterprise based in the developed country is a minority partner and does not have actual control of the installation through contractual or other means (affiliate relationship). The nature of the investment can be, for example, an acquisition of an existing installation, the construction of a new installation, or participation in a joint venture partnership.*

It should be noted that many of the provisions relating to the transfer of technology also apply to investments. Often the investment requires a transfer of technology, or a technology transfer is needed to bring the installation at issue up to the necessary degree of safety.

(*See paras. 2.i.11 – 18 on acquisitions and affiliated operations in general*)

■ 16.c.15 The prevention of accidents and ensuring safety should be one of the fundamental business considerations that enterprises based in developed countries - and international service organisations[3] and financial institutions - take into account when planning any investment related to a hazardous installation in a developing country or a CEIT. The amount of resources needed to comply with safety requirements, corporate safety policies and safety practices, as well as the influence of local needs and culture, should be taken into account when determining the levels of funding and assistance required in conjunction with the investment.

- 16.c.16 Investments by enterprises based in developed countries resulting in new enterprises should be accompanied by good design, engineering, construction and operational practices so that a high degree of safety can be maintained on a continuing basis. Account should be taken of the needs for education and training, as well as for the transfer of information, concerning the installation and its operation in the local community.

- 16.c.17 To the extent reasonably practicable, enterprises based in developed countries should ensure that subsidiaries apply policies and practices concerning accident prevention and emergency preparedness and response that are equivalent to those followed by the enterprise in the home country. Equivalent does not preclude the public authorities or enterprises from seeking to achieve a higher level of safety.

  - The means of implementing these policies and practices should be adapted to the particular local needs and circumstances, including legal, policy, administrative, technical and similar factors.

  - Line management of individual installations should develop its own safety programmes to implement the enterprise's Safety Policy.

  - Information concerning the hazardous installations and measures to adopt in the event of an emergency should be provided to employees (including (sub)contractors) and the local community through means as effective as those used by the enterprise in its home country.

  - Employees should have rights concerning participation in safety-related activities at the hazardous installation equivalent to those of employees in the home country.

- 16.c.18 The corporate Safety Policy of enterprises should be publicised in the relevant national language(s) in all hazardous installations of subsidiaries and, to the extent possible, in hazardous installations of affiliates.

- 16.c.19 An enterprise based in a developed country should endeavour to have affiliates adopt safety policies and practices that are comparable to its own, and should offer assistance to facilitate this objective.

- 16.c.20 An enterprise based in a developed country with investments in hazardous installations in developing countries or CEITs should co-operate with local officials to ensure that an appropriate infrastructure exists for emergency preparedness and response, siting/land-use planning, and provision of information to the public.

- 16.c.21 Safety experience (including, among other things, experience related to operation, training, maintenance, emergency preparedness and response) gained by an enterprise based in a developed country and operating in a developing country or a CEIT should be shared among local enterprises within the developing country/CEIT, while recognising the need to protect trade secrets.

- 16.c.22 International service organisations should take reasonable steps to ensure that their practices encourage the application of appropriate safety practices (as set out in these *Guiding Principles*). This could be done by, for example, following the relevant principles in their own activities and by bringing the *Guiding Principles* to the attention of the appropriate corporate or government clients.

Role of industry in countries receiving technology or investments

- 16.c.23 Management of hazardous installations in recipient countries should take the actions necessary to promote a level of safety for hazardous installations equivalent to that for similar installations in developed countries.

- 16.c.24 Management and other employees of hazardous installations should strive to ensure that safety policies and safe operating systems are created and followed and, more generally, to fulfil the roles and responsibilities concerning prevention, preparedness, and emergency response set out in the *Guiding Principles*.

  - To the extent that resources or skills are not available to take on these roles and responsibilities, or if problems arise, management should seek assistance from appropriate parties: *e.g.*, through contractual relationships or from a parent company, technology supplier, industry association, international organisation, *etc*.

  - The availability of sufficient personnel to operate the installation in a safe manner, and adequate education and training to maintain a qualified staff, are critical considerations. In addition, it is vital to establish management systems that are appropriate for the safe operation of the installation.

  - Industry in recipient countries should welcome assistance provided by technology suppliers, investors and manufacturers of chemicals (for example, through Product Stewardship programmes). Industry should make every effort to learn from the experience of others.

- 16.c.25 Management of hazardous installations should reach an understanding, with all relevant employees, concerning the types of information that can and should be requested from providers of technology, investment and aid, as well as how this information can be used in decision-making.

  - In this regard, management should establish appropriate means to: ensure that information necessary to the safe operation of the installation is provided and kept up-to-date by suppliers; understand what additional information is available; receive such information; and disseminate the information to all relevant employees.

  - Management of hazardous installations should also develop mechanisms to ensure that information is being used appropriately, *i.e.*, translated into knowledge and action, in particular in the establishment of safety policies and procedures.

  - Recipients of such information should make appropriate arrangements to protect legitimate trade secrets.

- 16.c.26 When operating in a community where the public authorities are not able to fulfil all their roles and responsibilities, industry should undertake the extra steps necessary to ensure the safety of hazardous installations. The type of assistance that is appropriate will depend upon local conditions but could include such things as provision of information and guidance, an expanded role in the development of off-site emergency plans or in the dissemination of information to the public, or provision of specialised emergency response equipment. The nature of the assistance should be clearly defined.

  - For example, the preparation of off-site plans is generally the responsibility of the local authorities. Where such authorities do not take on this responsibility, the management of hazardous installations should ensure sufficient preparedness planning to permit adequate response in the event of an accident.

  - In this regard, there should be co-operation among enterprises in a country or region.

- 16.c.27 Recipient enterprises should make every effort to ensure that appropriate hazard assessments are completed before any investment, aid project or transfer of technology related to hazardous installations takes place.

- Enterprises in recipient countries should participate actively in such assessments in order to ensure that local conditions are fully taken into account, including cultural, legal and environmental factors.

- Enterprises in recipient countries should make information concerning local conditions (*e.g.*, infrastructure, workforce, regulatory capability, emergency preparedness and response capability, and sensitive populations or environment) available to those responsible for the assessment.

- On a related subject, enterprises developing environmental impact assessments should take into account, when appropriate, the risks of accidents involving hazardous substances and the corresponding need for emergency preparedness and response.

- 16.c.28 Management and other employees in the recipient enterprise should participate in activities related to the adaptation of the technology for local application, to help ensure that the technology, including management structures, is appropriate to local conditions.

- 16.c.29 Management of hazardous installations in recipient countries should establish procedures to maintain safety over time and to manage changes to the installation that might affect safety. For example, modifications should be made only when adequate information and assessments are undertaken concerning the safety implications. Education and training programmes should be continuous, to maintain the skills of all employees and to ensure proper education and training of new employees.

- 16.c.30 Enterprises within a country or a region should establish mechanisms for sharing information and experience concerning safety at hazardous installations and, in particular, to consider issues of concern in the local cultural, political and environmental settings.

- 16.c.31 Industry should promote the idea that professional bodies, academics and research institutions should assist in evaluating information, developing codes, standards and training programmes, monitoring hazardous installations and providing information to the public, where needed.

- 16.c.32 Industry in recipient countries should encourage the dissemination of the *Guiding Principles* to all relevant stakeholders, including employees at all levels and non-industry organisations.

  - Management should also make an effort to help these parties understand and implement these principles.

  - Industry should support related activities of public authorities.

Role of public authorities in countries receiving technology or investments

- 16.c.33 Public authorities in countries receiving technology or investments should take the actions necessary to encourage all parties to maintain a level of safety for hazardous installations in developing countries and CEITs equivalent to that for similar installations in developed countries. For example, in case of a proposed transfer of technology or an investment from another country, public authorities should establish systems to ensure compliance by technology suppliers and receivers with appropriate safety practices and procedures, as described in these *Guiding Principles*.

- 16.c.34 Public authorities in countries receiving technology or investments should strive to fulfil their roles and responsibilities, as set out in the *Guiding Principles*, including the provisions dealing with prevention, land-use planning, emergency preparedness and emergency response.

- Recognising that this may not be fully possible given limited resources, public authorities should begin by establishing a basic legal and regulatory framework to help implement the *Guiding Principles*. Public authorities should establish priorities for action based on the nature of the hazardous installations that exist within their area of responsibility, and the problems associated with these installations, as well as the level of available resources.

- Where resources do not allow public authorities to fulfil all the roles and responsibilities indicated, they should rely on industry and other private sector groups to support government activities and meet desired objectives. For example, in countries with a limited public infrastructure, industry might be required to take a larger role in providing information to the public or in emergency planning. In this case, the division of responsibility between public authorities and industry should be clearly defined.

- With respect to a specific transfer of technology or investment, public authorities should, if necessary, request from the country and enterprise from which the technology or investment originates, or from international organisations, the information and assistance they need to fulfil their responsibilities. To do this, public authorities should be involved as early as possible in the planning process related to the transfer of technology or investment.

16.c.35 Public authorities in countries receiving technology or investments should establish an understanding of the types of information that can and should be requested and how this information can be used in decision-making.

- In this regard, public authorities should designate who is responsible for: requesting information, receiving such information, and disseminating the information to all relevant parties, including local authorities.

- Public authorities should also develop mechanisms to ensure that such information is being used appropriately, both in making decisions concerning individual hazardous installations and in more general decision-making. This would include land-use planning decisions, the preparation of emergency plans, and improving legal and regulatory infrastructures.

- Public authorities should take action so that appropriate arrangements are in place to ensure the protection of legitimate trade secrets.

16.c.36 To the extent possible, public authorities in countries receiving technology or investments should ensure that appropriate assessments are undertaken. In this regard, they should request all relevant information from the technology supplier.

- Public authorities should actively participate in the assessment of relevant proposals that might create or increase risks of accidents involving hazardous substances (related to, *e.g.*, a transfer of technology, an investment or aid related to a new installation, or significant changes to an existing installation) so that local conditions are fully taken into account, including cultural, legal and environmental factors.

- Public authorities should provide the information they have concerning relevant local conditions (*e.g.*, infrastructure, workforce, regulatory capability, emergency preparedness and response capability, and sensitive populations or environment) to those who are making the assessment.

- Public authorities should also ensure that environmental impact assessments take into account, when appropriate, the risks of accidents involving hazardous substances and the corresponding need for emergency preparedness and response capability.

- 16.c.37 Public authorities in countries receiving technology or investments should develop and, where appropriate, participate in activities related to the adaptation of the technology for local application, in order to help ensure that the technology, including management structures, is appropriate for local conditions.

- 16.c.38 When public authorities are party to agreements concerning the division of responsibilities among parties for a transfer of technology or an investment, they should ensure that human, financial and technical resources are available to carry out their responsibilities as agreed.

- 16.c.39 Public authorities in countries receiving technology or investments should establish and implement the principle that hazardous installations should be able to maintain an appropriate level of safety over time.

  - Significant modifications to existing hazardous installations, or to operating agreements for such installations, should not be undertaken without adequate consideration of safety. Normally, the management of the installation is responsible for carrying out the safety assessment and for ensuring that the appropriate information and skilled personnel are available to make the assessment.

  - Recognising that education and training of management and other employees is primarily the responsibility of industry, public authorities should take appropriate actions to help support, in general, the maintenance of a trained and educated industrial workforce, as well as trained and educated public authority staff.

- 16.c.40 To the extent possible, public authorities should establish procedures for monitoring imported technology and investments that may significantly increase the risk of an accident involving hazardous substances. These procedures should help ensure that appropriate information, education and training accompany the import or investment.

- 16.c.41 Public authorities should attempt to ensure that adequate emergency response capability is available in the event of an accident at a hazardous installation. It is recognised that many local communities may not have sufficient trained emergency response personnel, equipment and facilities to respond in the event of an accident. However, this problem could be overcome by, for example, providing resources at a regional or national level, requiring industry to supply the missing equipment, personnel and facilities (*e.g.*, through mutual aid systems within industry), or entering into co-operative agreements with neighbouring communities.

Chapter 17

FIXED INSTALLATIONS AND TRANSPORT

This Chapter addresses limited aspects of transport of hazardous substances (dangerous goods). Specifically, it provides guidance related to transport to the extent it involves fixed facilities. This includes:

- *transport interfaces in general (e.g., railroad marshalling yards, road terminals, airports, loading and unloading facilities);*
- *port areas; and*
- *pipelines.*

(See text box below for examples of what differentiates transport interfaces from other fixed installations for purposes of chemical accident prevention, preparedness and response)

It is important to recognise that this Chapter supplements the rest of the Guiding Principles. In other words, while the provisions of the other sections of the Guiding Principles apply to transport interfaces and other aspects of transport involving fixed facilities, this Chapter provides supplemental guidance specific to the context of transport interfaces (including port areas) and pipelines.

Also, it provides guidance on the roles and responsibilities of interested stakeholders which, in addition to the stakeholders addressed generally in the Guiding Principles, here include the owners/operators of the transport interfaces and pipelines, the owners/operators of the transport modes (ships, trucks, trains), and the labour involved in the transport and loading/unloading operations.

This Chapter takes into account that a prerequisite for safe transport and handling of hazardous substances is the proper identification of their hazards as well as proper containment, packaging, packing, cargo separation, securing, marking, labelling, placarding and documentation.

Each country/jurisdiction should decide the point where substances are covered by regulations relating to transportation, and where they are covered by other requirements (e.g., those that apply to storage or to fixed installations in general). The allocation of responsibility can differ among countries but, in no case, should there be gaps in regulation.

a. TRANSPORT INTERFACES[4]

■ 17.a.1 The geographical boundaries of transport interfaces that handle hazardous substances should be clearly defined and should include areas where hazardous substances are handled, transported and/or kept temporarily.

- Areas where hazardous substances are kept should be clearly marked, properly supervised, and regularly inspected for leakage or damage.

- Land-use planning arrangements should be applied to transport interfaces to help ensure that they are appropriately sited to minimise the risks of adverse effects in the event of an accident, and to prevent the placing of inappropriate developments near the interface.

- Planning and construction of new and expanded facilities at transport interfaces should take account of the requirements for prevention of, and response to, accidents involving hazardous substances. This involves preparing an assessment of the risks to determine the probability of accidents and their possible effects on health and the environment, and incorporating appropriate safety features and equipment.

- Appropriate arrangements should be in place to maintain the security of transport interfaces where hazardous substances are located to minimise the possibility of security breaches due to, for example, terrorist activities, sabotage, vandalism or theft of such substances.

RELEVANT CHARACTERISTICS OF TRANSPORT INTERFACES

There are a number of characteristics that differentiate transport interfaces from fixed installations for purposes of chemical accident prevention, preparedness and response. These include:

- different modes of transport meet at the interface, with different supervisory bodies and possibly different safety practices;
- there are changing amounts and types of hazardous substances at the interface, including bulk and packaged cargo;
- there are continuous transfer and handling operations;
- packaging, labelling and documentation are likely to be carried out in remote locations, outside the control of those responsible for safety in the interface; and
- the stakeholders concerned are both different and more numerous. For example, the "operator" or "manager" of the interface could be a private party or public authority; and workers at interfaces include operators of the transport mode (*e.g.*, drivers), those responsible for loading and unloading operations (e.g., stevedores) and others who may be employed by different companies. Other parties critical to chemical accident prevention, preparedness and response at interfaces include: carriers/transporters; consignors/shippers of the hazardous substances; those responsible for packaging and labelling; and customers. At port areas there are a number of additional stakeholders.

17.a.2 The various parties involved with handling hazardous substances at transport interfaces should co-operate to help ensure the safe operation of transport interfaces and to provide for emergency preparedness and response. These parties include operators of transport interfaces, the carriers/transporters for all the modes of transport that utilise the interface, cargo interests,[5] customers, public authorities and others.

17.a.3 All parties involved in transport of hazardous substances should ensure that they have access to information necessary to fulfil their responsibilities for the safe handling of cargo containing hazardous substances and to provide information to others concerning the substances.

- Those responsible for the shipping, packing, packaging, repackaging, marking, securing, labelling, placarding and documentation of hazardous substances at the hazardous installation should ensure that all relevant information is passed on to those involved in the transport chain. This information should allow for the tracking of cargo containing hazardous substances and should, *inter alia*, address the substances being handled, as well as provide guidance for safe handling, emergency preparedness, and response to incidents.

- The guidance should be in a form and in a language that can be understood by those that might need to take emergency action, including drivers and response personnel.

17.a.4 All parties in the transport chain should ensure that their employees (including contractors) are competent and adequately trained to handle hazardous substances under both normal and abnormal conditions.

17.a.5 Operators/managers should prepare "safety reports" for transport interfaces where there are risks of significant accidents involving hazardous substances, with the reports tailored to the level of the hazard potential of each site.

(*See paras. 2.a.16 – 18 on safety reporting*)

17.a.6 Operators/managers should develop and enforce a safety management system and procedures necessary for the safe handling of hazardous substances at the transport interface. The safety management system should address all the modes of transport using the interface, not just the primary mode (*e.g.*, operators of railroad marshalling yards should also be concerned with trucks that transport hazardous substances to the yards.)

(*See paras. 2.a.14 – 15 on safety management systems*)

17.a.7 Operators/managers should ensure that the equipment and safety systems (including hardware and software) used at transport interfaces are suitable for their purposes and are compatible with current technical standards.

- One of the most common risks at transport interfaces involves loading/unloading operations. Particular attention should therefore be paid to equipment for such operations including, for example, cranes, pumps, flexible hoses, and pipelines, as well as instrumentation for monitoring equipment, automatic overflow indicators and automatic shutdown systems.

- Operators/managers of transport interfaces should ensure that all equipment and safety systems used in connection with loading/unloading operations and with other handling of hazardous substances are appropriately serviced and controlled. In this regard, it should be recognised that the equipment and systems may be owned by different contractors.

- Operators/managers should ensure that the equipment and safety systems are designed and operated in a way that minimises the risk of human error, and that employees are trained in the safe operation of the equipment and systems (recognising that there often are (sub)contractors or short-term workers at transport interfaces).

- Operators/managers should seek to replace outmoded technology where safer alternatives are available.

17.a.8 Operators/managers should also:

- ensure that they have adequate information for the safe handling of the hazardous substance and, in this regard, have systems for being notified in advance of the arrival and departure of hazardous substances intended for transit, handling or temporary holding at transport interfaces;
- keep records of hazardous substances arriving at transport interfaces, including their quantities and classification, and their location;
- establish mechanisms to ensure that all relevant contractors are competent for the work to be undertaken, and avoid contracting if it would compromise safety;
- establish systems for screening/reviewing the competence of carriers and equipment to be used;

- have procedures in place for dealing with damaged cargoes involving hazardous substances; and
- be empowered to refuse cargo if is considered to endanger health or the environment, including property.

■ 17.a.9 Cargo interests (including, *e.g.*, cargo manufacturers, consignors/shippers, forwarders, consolidators, packers, brokers and traders) should:

- ensure that information necessary for safe handling of the hazardous substances, and for emergency preparedness and response, is available to the managers of transport interfaces and, as appropriate, to public authorities; and
- establish systems for screening/reviewing the competence of carriers and equipment to be used.

■ 17.a.10 Carriers/transporters should:

- maintain an inventory of products being transported;
- ensure the selection and maintenance of appropriate equipment; and
- ensure that all paperwork is properly passed along for, or to, the next responsible party in the transportation chain, and that the handover of goods is well documented when loading, unloading or transferring hazardous substances.

■ 17.a.11 Customers (with respect to the transport interface at the delivery point) should:

- ensure that they have the types of information needed for the safe handling of the hazardous substances, and for emergency preparedness and response; and
- have procedures and equipment/facilities in place for handling leaking or damaged containers, and to collect and move the substances to safe storage areas as quickly as possible.

■ 17.a.12 Special consideration should be given to the storage of hazardous substances at transport interfaces.

⏩ In this regard, regulations concerning the storage of hazardous substances should apply to storage of such substances at transport interfaces.

⏩ The extent of storage of hazardous substances (in terms of their quantity, hazardous nature, and length of time stored) at transport interfaces should be minimised to the extent consistent with increased safety (reducing the overall likelihood, or consequences of, accidents involving hazardous substances).

■ 17.a.13 Public authorities should ensure that their control framework and enforcement activities (including monitoring and inspection) address transport interfaces. This control framework should, *inter alia*:

- address the competency of managers and carriers to handle safely the hazardous substances that will be at the interfaces; and
- determine the classes and quantities of hazardous substances that may be permitted to be handled, or in transit, at a transport interface, and the conditions under which they are to be handled.

■ 17.a.14 There should be emergency planning at transport interfaces handling hazardous substances, and it should be well co-ordinated with the off-site emergency plan and other relevant plans.

⏩ The emergency planning should ensure that there is adequate access for response personnel in the event of an accident.

⏩ Response materials and equipment required by the on and off-site emergency plans should be available at the transport interface.

- There should be an inventory of the substances on-site for purposes of emergency planning, and to facilitate response actions in the event of an accident.

17.a.15 Operators/managers and public authorities should make a concerted effort to ensure that information concerning potential hazards, and the appropriate actions to be taken in the event of an accident, is provided on a continuing basis to the potentially affected public.

- Since transport interfaces present a significant challenge in this respect, innovative approaches may be needed to ensure that the public is appropriately informed.

- Public authorities and industry should endeavour to share information and experience concerning communication with the public in connection with transport interfaces.

17.a.16 Systems should be in place for the timely notification/reporting of incidents (accidents and near-misses) at a transport interface.

- Specifically, cargo interests, carriers/transporters and customers should notify the operators/managers of the interface in the event of an incident involving hazardous substances (*e.g.*, leaking or damaged containers) and, when appropriate, should notify the public authorities (including response personnel) and the manufacturers of the substances.

- Further efforts should be made to share experience both within a country, and among countries, concerning incidents at transport interfaces.

17.a.17 At the national level, public authorities should have a consistent approach with respect to the laws and policies - including mechanisms for oversight and co-ordination - relating to all modes of transport. This helps to ensure that there are no gaps or inconsistencies in regulatory requirements, or in the allocation of responsibilities, as hazardous substances move from one transport mode to another.

17.a.18 Efforts should be made to improve harmonisation of laws and policies that address transport interfaces.[6]

- Consistent approaches among countries help to create "a level playing field", meaning that no country provides an economic advantage to industry as a result of less stringent safety standards.

- Harmonisation of laws and policies also helps to avoid barriers to trade and results in an overall reduction in costs because those involved in multiple countries/regions do not have to comply with differing standards. This is particularly important in the case of transport-related issues, where hazardous substances may cross borders.

17.a.19 Public authorities should also continue to co-operate to further efforts towards the harmonisation of international requirements for different modes of transport. In light of the different modes of transport that meet in transport interfaces (including ships, inland barges, trains, trucks and pipelines), there should be consistency among the various rules, regulations and policies relating to the transport, packaging and handling of hazardous substances. The Recommendations of the UN Committee of Experts on Transport of Dangerous Goods provide the basis for harmonisation of requirements for various modes of transport involving packaged goods.

17.a.20 Management of hazardous installations should endeavour to choose the safest practicable means of transport and the safest practicable routing of hazardous substances being taken from, or delivered to, an installation. This will help to, for example, minimise the number of people potentially affected in the event of an accident.

- Risk assessments should be used as one input into the decision-making process to compare various modes of transport and alternative routing of dangerous goods traffic.

(See Section 2.b related to hazard identification and risk assessment)

- The choice of transport mode should be case-specific, as studies indicate that no one mode is generically safer than another. Safety is dependent on a number of factors, such as the substance involved, the route used, and local management practices.

- To the extent that management of a hazardous installation can choose between transport modes and routes for hazardous substances, the decisions should take into account broader environmental and health considerations.

- Management of hazardous installations should ensure that the transporters of their products meet national and international safety requirements. To the extent possible, the choice of transporters should be on the basis of their past safety performance.

- Management should co-operate with public authorities (including authorities at the local level) when making transport and routing decisions concerning the transport of hazardous substances.

■ 17.a.21 Efforts should be made to improve the collection of information on the extent and nature of transport of hazardous substances, and the sharing of such information among appropriate stakeholders.

b. PORT AREAS

This Section focuses on issues that specifically concern port areas.[7] Port areas are a subset of transport interfaces and, therefore, all the provisions of the Guiding Principles (including Section 17.a above related to transport interfaces) apply to port areas. Because port areas have certain additional characteristics, as well as additional stakeholders, that differentiate them from other transport interfaces, further guidance is appropriate. These characteristics include:

- *Ports are inherently international in nature, with operators, ships and cargoes coming from different countries.*
- *Ports are large, complex entities involving sea-going traffic and inland (river, rail and road) transport of hazardous substances. They may contain a number of fixed installations including terminals, warehouses, and repair/maintenance facilities where hazardous substances are transferred, used, handled or stored.*
- *The complexity of port areas complicates land-use planning decisions related to developments both within and outside these areas.*
- *For historic reasons, ports tend to be located near large, densely populated areas, and waterfront locations often attract housing and other developments.*
- *The ship-shore interface creates the potential, on an operational level, for a conflict of interest between environmental protection and marine safety.*
- *Stakeholders at ports, in addition to those involved in other transport interfaces, include, for example, port authorities, ships agents, flag state administrations of ships using the port, berth operators, and ship and cargo surveying agents.*

(This Section contains excerpts from the joint OECD/IMO publication "Guidance concerning Chemical Safety in Port Areas" (1996). This publication can be obtained from the OECD and can be found at www.oecd.org/ehs.)

■ 17.b.1 Port authorities should develop and enforce local port rules, consistent with relevant laws and regulations, to address the safety of hazardous substances in port areas.

- All operators in a port area should co-ordinate with the port authorities, and with relevant public authorities, to help ensure that actions of different operators do not increase the risk of accidents (*e.g.*, through domino effects) and to facilitate emergency planning and response.

- Port authorities are responsible for being aware of the activities of each operator in their port areas and for ensuring appropriate co-operation, and communication, with public authorities.

17.b.2 Port authorities should ensure that all users of their ports (such as berth operators) establish operational procedures for activities and events that could increase the risk of an accident involving hazardous substances.

17.b.3 An international body should develop parameters for the safe operation of ships entering and manoeuvring in ports, which can be adapted to the circumstances of an individual port.

17.b.4 An international system should be developed for the reporting of ship deficiencies affecting accident potential and for the dissemination of these reports to port authorities.

17.b.5 Port authorities should establish procedures for proper maintenance and repair operations on ships that carry hazardous substances.

17.b.6 Prior to entering a port area, the master of a ship carrying hazardous substances should check the material condition of the ship and cargo for their readiness to safely enter the port and engage in cargo handling operations.

- The master should inform the port authority of any relevant deficiency of the ship, its machinery, equipment or appliances, or any leakage of hazardous substances or damage to their containment that may present a risk of an accident involving hazardous substances.

- The master should ensure that, upon entering the port area, any safety requirements, including those pertaining to the proper stowage, packaging and segregation of hazardous substances, are carefully followed.

17.b.7 Berth operators should ensure that adequate and safe mooring facilities are provided and that adequate safe access is provided between ship and shore.

- Berth operators should ensure that a list of all hazardous substances in their facilities, with their locations and safety-related information, is readily available.

- Berth operators should ensure that hazardous substances entering their premises have been duly certified or declared by the relevant cargo interests as being properly identified, packed, marked, labeled and placarded.
- Berth operators should ensure that no person, without reasonable cause, opens or otherwise interferes with any container, tank or vehicle containing hazardous substances.

17.b.8 Berth operators should co-ordinate with ship's masters and the individuals responsible for other transport modes to ensure that all relevant regulations and codes are followed for proper cargo transfer and stowage of hazardous substances.

17.b.9 Cargo interests should ensure that containers, tanks and vehicles used for carrying hazardous substances have a current safety approval. Cargo interests should ensure that the physical condition of each freight container, tank-container, portable tank or vehicle is checked for obvious damage potentially affecting safety.

17.b.10 Cargo interests and berth operators should ensure that every necessary support will be given to the port authority or any other person or institution entitled to carry out inspections or audits.

17.b.11 Public authorities should ensure that all emergency plans in the port area are mutually consistent and are operationally controlled by a designated party or authority.

- Emergency plans should take into account that port operations typically involve a large number of diverse public and private entities.

- Whenever possible, port emergency planners should use internationally recognised and accepted methodologies to ensure compatibility of approach and commonality of terms.

17.b.12 Ship's masters should be informed of how the port emergency response is organised and how their ship and crew fit into this system. The port authority should be informed of a ship's response plan, so that actions can be co-ordinated. At each cargo transfer site, the ship's master and the berth operator should agree on the appropriate emergency procedures.

17.b.13 Port emergency plans should take into account that hazardous substances may be carried into the port area by ships and other modes even if they are not to be (un)loaded there. Emergency plans should also take into account the possibility of shipboard emergencies involving hazardous substances posing a threat to the port or the marine environment.

17.b.14 Port emergency response forces should be available and ready to respond to accidents wherever they occur in a port area. In this regard, they should be able to effectively respond and support operations from quayside to ship, on the quay, on land, and ship-to-ship.

c. PIPELINES

While the provisions of the all Guiding Principles generally apply to pipelines, this Section addresses special concerns with respect to pipelines transporting hazardous substances. For purposes of this publication, pipelines[8] are defined to include ancillary facilities, such as pumping and compression stations.

Pipelines are recognised as an increasingly important option for transporting a variety of hazardous substances in addition to petrochemicals. Experience indicates that they are a generally safe and, for certain substances, a vital means for transport. Among the advantages of pipelines is that they can move large quantities of hazardous substances quickly, relatively inexpensively and reliably, with relatively few associated impacts on the environment (as compared with other transport modes that involve vehicular exhaust, aesthetic impacts, noise, congestion).

The disadvantages of pipelines include infrastructure costs associated with construction, the delays inherent in making a pipeline operational, the problems associated with soil protection, and the lack of flexibility in regard to delivery points and quantities that can be transported.

Regulatory approaches to pipelines differ significantly among countries although there are common elements in most approaches (including a general obligation to operate safely). Despite the differences in regulatory approaches, industry appears to have similar safety practices in different countries in order to maintain the integrity of pipeline networks.

17.c.1 Pipelines for transporting hazardous substances should be designed, constructed, operated, maintained and monitored so as to reduce the frequency of accidents and to mitigate the consequences of accidents that do occur.

- Pipelines should be designed, constructed and operated consistent with recognised national and international codes, standards, and guidance, as well as company specifications.

- Consideration should be given to various aspects which could have an impact on the safety of a pipeline including, *e.g.*, design and stress factors, material quality, wall thickness, depth of burial, external impact protection, markings, route selection and monitoring.

- Comparative risk assessments should be undertaken in order to choose from among different materials and other options.

- Pipelines should be constructed with the most suitable materials available to ensure their integrity initially and throughout their lifecycle. Appropriate safety technology should be used such as automatic shutdown systems (in the event of a leak or accident) or safety release systems.

- Adequate safety signs should be installed along the pipeline route.

17.c.2 Land-use planning considerations and risk assessments should be taken into account both in the routing of new pipelines (*e.g.*, to limit proximity to populated areas to the extent possible), and in decisions concerning proposals for new developments/building in the vicinity of existing pipelines.

- Environmental impact assessment for geological hazards should also be taken into account in order to avoid (to the extent possible) hazardous geologic environments, such as areas susceptible to sinkholes and seismic activity.

- Routing of pipelines should be chosen to minimise adverse impacts in the event of an accident, and to facilitate access for maintenance and for emergency response personnel.

17.c.3 Industry should develop safety management systems to meet safety objectives during design, construction, operation, maintenance and decommissioning of pipelines.

- Elements of safety management systems for pipelines include: clear objectives and polices; a suitable organisation with clear definitions of asset ownership and related responsibilities; competent staff and effective education and training; adequate standards and procedures; performance monitoring and suitable audit/review procedures to identify shortcomings and make corrections; emergency response procedures which are regularly tested and reviewed; and accident investigations.

(*See paras.* 2.*a.*14 – 15 *related to safety management systems*)

- Industry should continue to share its experience with respect to the use of safety management systems for pipelines, and improve the efficiency of individual elements/techniques of these systems, with the aim of further reducing pipeline accidents.

17.c.4 The integrity of pipelines should be maintained through adequate maintenance, inspection and monitoring, and sound management.

- Means for inspection and monitoring include the use of "intelligent pigs," patrolling, and aerial surveillance.

- In addition to regular maintenance, the objective of continued improvement in safety performance can be achieved by inspection and monitoring, a wider exchange of information among operators, taking into account lessons learned from reported incidents, and utilisation of new technologies and other developments.

- As pipelines age, additional monitoring may be necessary to continue to ensure their integrity. Consideration should be given to reviewing and revalidating pipelines and their operating conditions once they reach the end of their originally-intended design life.

- Policies should be in place for replacing pipelines, or parts of pipelines, that may not meet safety standards or have reached the limits of their design life.

17.c.5 While the general principles applicable to emergency planning for hazardous installations also apply to pipelines, it may be necessary to make further efforts, taking into account the specific

situation of pipelines including, for example, the hazards associated with the substance they transport.

- Emergency planning for pipelines may be complicated because of some of their characteristics including, for example: the fact that pipelines are normally unmanned; the length and location of pipelines; the need to be able to shut off or depressurise the flow of materials; and the need to ensure access by emergency response personnel. In addition, account should be taken of nearby developments. For example, where pipelines cross or parallel rail lines, it is important to interface with plans of the rail industry.

- Emergency planning should take into account a risk assessment of the pipeline system.

- In light of these complexities, it is important to get input from emergency response personnel when preparing, reviewing and revising emergency plans related to pipelines.

- 17.c.6 Industry responsible for pipelines should review and, as necessary, develop and implement systems to reduce third-party interference, as this is a major cause of accidents.

  - This should be done in co-operation with public authorities in all regions/countries.

  - Systems for reducing third-party interference involve ensuring that proper information is circulated among interested parties concerning the locations of pipelines in a given area. In addition, it is important to facilitate communication between the pipeline operator and third parties, such as through "one call" systems that provide information about pipelines at one, well publicised source.

- 17.c.7 In order to facilitate learning from experience, industry responsible for pipelines (as well as public authorities and other stakeholders) should improve sharing of information on improving safety of pipelines and on accidents/near-miss case histories.

  - This should include information concerning pipelines that reach the end of their intended useful or design life. Options for dealing with pipelines that are no longer in use include removal, outright abandonment, or abandonment with additional actions. Care should be taken to properly assess the associated risks of each option, on a case-by-case basis, recognising that the best solution in a given situation may be a combination of methods.

  - Information should also be pooled and shared on the extent of pipeline systems, on the amount of materials they convey, and on statistical analyses of the use of pipelines to transport hazardous substances.

  - Information should be collected and made available concerning the relationship between failure and the characteristics of the pipeline, in order to better understand the nature and causes of accidents (*e.g.*, relating to age, size, location, and construction of the pipeline).

NOTES

1. For purposes of this publication, developing countries and countries in economic transition that receive assistance as part of technical co-operation activities are collectively called "recipient countries".

2. For purposes of this publication, aid agencies include bilateral aid agencies of individual countries that provide technical and financial assistance to developing countries and countries with economies in transition, as well as multilateral organisations providing such assistance (*e.g.*, World Bank and regional development banks).

3. These include, for example, engineering companies, law firms, consultancies, and financial advisors.

4. For purposes of this publication, a "transport interface" is defined as: fixed (identified) areas where hazardous substances (dangerous goods) are transferred from one transport mode to another (*e.g.*, road to rail, or ship to pipeline); transferred within one transport mode from one piece of equipment to another (*e.g.*, from one truck to another); transferred from a transport mode to a fixed installation or from the installation to a transport mode; or stored temporarily during transfer between transport modes or equipment. Thus, transport interfaces involve, for example, loading and unloading operations, transfer facilities, temporary holding or keeping of hazardous substances during cargo transfer (*e.g.*, warehousing), and handling of damaged vehicles or spilled goods. Examples include: railroad marshalling yards, port areas, receiving/loading docks at hazardous installations, terminals for roads and for intermodal transport between road and rail, airports, and transfer facilities at fixed installations.

5. These include, for example, cargo manufacturers, consignors/shippers, forwarders, consolidators, packers, brokers and traders.

6. The existing international agreements related to transport of dangerous goods should also apply during handling at transport interfaces. The international "regulations" provide a good basis for harmonised regulation of various transport modes.

7. For purposes of this publication "port areas" are defined as the land and sea area established by legislation, including the fixed facilities and vessels (ships and others) in the area. Hazardous substances may be in port areas to be loaded or unloaded from ships, inland barges, trains, trucks, or pipelines; or to be held as cargo in ships without being handled in the port; or as packaged goods handled for consolidation or dispersal.

8. Pipelines can be defined as a tube, usually cylindrical, through which a hazardous substance flows from one point to another.

ANNEXES

ANNEX I

EXPLANATION OF TERMS USED

The terms set out below are explained for the purposes of this document only, and should not be taken as generally agreed definitions or as terms that have been harmonised between countries and organisations. To the extent possible, common definitions of these terms are used.

Acceptability/tolerability of risk:
A willingness to live with a risk in order to secure certain benefits.

Accident or chemical accident:
Any unplanned event involving hazardous substances that causes, or is liable to cause, harm to health, the environment, or property. This excludes any long-term events (such as chronic pollution).

Activities indicators:
See "Indicators".

Affiliates:
Enterprises in which another enterprise has minority voting rights and no effective operational control.

Aid agency:
Aid agencies include: bilateral assistance/development agencies of individual countries that provide technical and/or financial assistance to developing countries and countries with economies in transition; and multilateral organisations providing such assistance (*e.g.*, World Bank and regional development banks).

Audit:
A systematic examination of a hazardous installation to help verify conformance with regulations, standards, guidelines and/or internal policies. This includes the resultant report(s) but not subsequent follow-up activities. Audits can include examinations performed either by, or on behalf of, management of a hazardous installation (self or internal audit), or an examination by an independent third party (external audit).

Berth:
Any dock, pier, jetty, quay, wharf, marine terminal, or similar structure (whether floating or not) at which a ship may tie up. This includes any plant or premises, other than a ship, used for purposes ancillary or incidental to the loading or unloading of hazardous substances.

Berth operator:
Any person or body of persons who has (for the time being) the day-to-day control of the operation of a berth.

Bulk:
Cargoes which are intended to be transported without any intermediate form of containment in a cargo space.

Cargo interests:
A shipper, carrier, forwarder, consolidator, packing centre, or any person, company or institution involved in any of the following activities: identification, containment, packaging, packing, securing, marking, labelling, placarding, or documentation, as appropriate, of cargoes involving hazardous substances, and having control over the cargo at any time.

Chemical accident:
See "Accident".

Chemical industry:
Enterprises that produce, formulate and/or sell chemical substances (including basic and specialty chemicals, consumer care products, agrochemicals, petrochemicals, and pharmaceuticals).

Community(ies):
Individuals living/working near hazardous installations who may be affected in the event of a chemical accident.

Contractors:
Includes all contractors and subcontractors.

Consequence:
Result of a specific event.

Emergency preparedness plan (or) **emergency plan:**
A formal written plan which, on the basis of identified potential accidents together with their consequences, describes how such accidents and their consequences should be handled, either on-site or off-site.

Employee:
Any individual(s) working at, or on behalf of, a hazardous installation. This includes both management and labour, as well as (sub)contractors.

Enterprise:
A company or corporation (including transnational corporations) that has operations involving production, processing, handling, storage, use and/or disposal of hazardous substances.

Ergonomics:
A discipline concerned with designing plant, equipment, operation and work environments so that they match human capabilities.

Hazard:
An inherent property of a substance, agent, source of energy or situation having the potential of causing undesirable consequences.

Hazard analysis:
Identification of individual hazards of a system, determination of the mechanisms by which they could give rise to undesired events, and evaluation of the consequences of these events on health, (including public health) environment and property.

Hazardous installation:
A fixed industrial plant/site at which hazardous substances are produced, processed, handled, stored, used or disposed of in such a form and quantity that there is a risk of an accident involving hazardous substance(s) that could cause serious harm to human health or damage to the environment, including property.

Hazardous substance:

An element, compound, mixture or preparation which, by virtue of its chemical, physical or (eco)toxicological properties, constitutes a hazard. Hazardous substances also include substances not normally considered hazardous but which, under specific circumstances (*e.g.*, fire, runaway reactions), react with other substances or operating conditions (temperature, pressure) to generate hazardous substances.

Human factors:

Human factors involve designing machines, operations and work environments so that they match human capabilities, limitations and needs (and, therefore, is broader than concerns related to the man-machine interface). It is based on the study of people in the work environment (operators, managers, maintenance staff, and others) and of factors that generally influence humans in their relationship with the technical installation (including the individual, the organisation and the technology).

Human performance:

All aspects of human action relevant to the safe operation of a hazardous installation, in all phases of the installation from conception and design, through operation, maintenance, decommissioning, and shutdown.

Incidents:

Accidents and/or near-misses.

Indicators:

Activities indicators

A means for measuring actions or conditions which, within the context of a programme related to chemical accident prevention, preparedness and response, should maintain or lead to improvements in safety (*e.g.*, reduction in risk, improvements in safety management and safety culture, mitigation of adverse effects in event of an accident). These indicators generally take the form of a non-exclusive checklist providing examples of actions/conditions that are believed to contribute to improvements in safety. Users are expected to choose those elements of the checklist that are appropriate to their situation, and add other elements as appropriate.

Outcome indicators

A means for measuring the results, effects or consequences of activities carried out in the context of a programme related to chemical accident prevention, preparedness and response. For purposes of this document, outcome indicators are designed to measure whether actions taken are achieving the intended results (*i.e.*, a measurable quantitative or qualitative opinion about improvements in safety performance relating to the likelihood of an accident occurring, and/or the extent of impacts on human health and the environment from accidents that do occur).

Safety performance indicators

A means for measuring the changes over time in the level of safety (related to chemical accident prevention, preparedness and response), as the result of actions taken. For purposes of this document, safety performance indicators are based on both activities indicators and outcome indicators.

Information:

Facts or data or other knowledge which can be provided by any means including, for example, electronic, print, audio or visual.

Inspection:

A control performed by public authorities. There may be (an)other party/ies involved in the inspection, acting on behalf of the authorities. An inspection includes the resultant report(s) but not subsequent follow-up activities.

Interface:
See "Transport interface".

Labour:
Any individual(s) working at, or on behalf of, a hazardous installation who are not part of management. This includes (sub)contractors.

Land-use planning:
Consists of various procedures to achieve both general zoning/physical planning, as well as case-by-case decision-making concerning the siting of an installation or of other developments.

Local authorities:
Government bodies at local level (*e.g.*, city, county, province). For purposes of this document, these include bodies responsible for public health, rescue and fire services, police, worker safety, environment, *etc*.

Management:
Any individual(s) or legal entity (public or private) having decision-making responsibility for the enterprise, including owners and managers.

Master:
Any person, other than a pilot or watchman, having charge of a ship.

Monitor (or) monitoring:
Use of checks, inspections, tours, visits, sampling and measurements, surveys, reviews or audits to measure compliance with relevant laws, regulations, standards, codes, procedures and/or practices; includes activities of public authorities, industry and independent bodies.

Near-miss:
Any unplanned event which, but for the mitigation effects of safety systems or procedures, could have caused harm to health, the environment or property, or could have involved a loss of containment possibly giving rise to adverse effects involving hazardous substances.

Outcome indicators:
See "Indicators".

Pipeline:
A tube, usually cylindrical, through which a hazardous substance flows from one point to another. For purposes of this publication, pipelines include any ancillary facilities such as pumping and compression stations.

Port area:
The land and sea area established by legislation. (Note: some port areas may overlap. Legal requirements should take account of this possibility.)

Port authority:
Any person or body of persons empowered to exercise effective control in a port area.

Probability:
The likelihood that a considered occurrence will take place.

Producer(s) (chemical)**:**
Enterprises that manufacture or formulate chemical products (including basic and specialty chemicals, consumer care products, agrochemicals, petrochemicals, and pharmaceuticals).

Product Stewardship:
A system of managing products through all stages of their life cycle, including customer use and disposal (with the objective of continuously improving safety for health and the environment).

Public authorities:
Government bodies at national, regional, local and international level.

Reasonably practicable:
All which is possible, subject to the qualification that the costs of the measures involved are not grossly disproportionate to the value of the benefits obtained from these measures.

Risk:
The combination of a consequence and the probability of its occurrence.

Risk assessment:
The informed value judgment of the significance of a risk, identified by a risk analysis, taking into account any relevant criteria.

Risk communication:
The sharing of information, or dialogue, among stakeholders about issues related to chemical accident prevention, preparedness and response including, *e.g.*: health and environmental risks and their significance; policies and strategies aimed at managing the risks and preventing accidents; and actions to be taken to mitigate the effects of an accident. For purposes of this document, risk communication includes dialogue and sharing of information among the public, public authorities, industry and other stakeholders.

Risk management:
Actions taken to achieve or improve the safety of an installation and its operation.

Root cause(s):
The prime reason(s) that lead(s) to an unsafe act or condition and result(s) in an accident or near miss. In other words, a root cause is a cause that, if eliminated, would prevent the scenario from progressing to an accident. Root causes could include, for example, deficiencies in management systems that lead to faulty design or maintenance, or that lead to inadequate staffing.

Safety management system:
The part of the an enterprise's general management system that includes the organisational structure, responsibilities, practices, procedures, processes, and resources for determining and implementing a chemical accident prevention policy. The safety management system normally addresses a number of issues including, but not limited to: organisation and personnel; identification and evaluation of hazards and risks; operational control; management of change; planning for emergencies; monitoring performance; audit and review.

Safety performance indicators:
See "Indicators".

Safety report:
The written presentation of technical, management and operational information concerning the hazards of a hazardous installation and their control in support of a justification for the safety of the installation.

Ship:
Any seagoing or non-seagoing water craft, including those used on inland waters, used for the transport of hazardous substances.

Stakeholder:
Any individual, group or organisation that is involved, interested in, or potentially affected by chemical accident prevention, preparedness and response. A description of stakeholders groups is included on in the Introduction to this publication under "Scope".

Storage facilities:
Warehouses, tank farms and other facilities where hazardous substances are held.

Subsidiaries:
Enterprises in which another enterprise has majority voting rights and/or effective operational control.

Transfer of technology:
The movement of process and other safety-related technology from one country to another, embracing not only the actual transfer but also the application of the technology and the operation of the plant.

Transboundary accident:
An accident involving hazardous substances that occurs in one jurisdiction and causes adverse health or environmental consequences (effects), or has the potential to cause such consequences, in another jurisdiction (within a country or across national boundaries).

Transport interface:
Fixed (identified) areas where hazardous substances (dangerous goods) are transferred from onetransport mode to another (*e.g.*, road to rail, or ship to pipeline); transferred within one transport mode from one piece of equipment to another (*e.g.*, from one truck to another); transferred from a transport mode to a fixed installation or from the installation to a transport mode; or stored temporarily during transfer between transport modes or equipment. Thus, transport interfaces involve, for example, loading and unloading operations, transfer facilities, temporary holding or keeping of hazardous substances during cargo transfer (*e.g.*, warehousing), and handling of damaged vehicles or spilled goods. Examples include: railroad marshalling yards, port areas, receiving/loading docks at hazardous installations, terminals for roads and for intermodal transport between road and rail, airports, and transfer facilities at fixed installations.

Triage:
The assessment of the clinical condition of exposed individuals, with the designation of priorities for decontamination, treatment and transportation.

Warehouse keeper:
The person responsible for a storage facility, whether on the site of a hazardous installation or off-site.

ANNEX II

ACRONYMS

ACC:	American Chemistry Council (formerly CMA)
ADN:	European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway (UNECE)
ADR:	European Agreement concerning the International Carriage of Dangerous Goods by Road (UNECE)
AEGLs:	Acute Exposure Guideline Levels
AGEE:	Advisory Group on Environmental Emergencies (Joint UNEP/OCHA Environment Unit)
APELL:	Awareness and Preparedness for Emergencies at Local Level (UNEP)
BIAC:	Business and Industry Advisory Committee to OECD
CAMEO:	Computer-aided management of emergency operations
CARAT:	Chemical Accident Risk Assessment Thesaurus (OECD)
CCPA:	Canadian Chemical Producers Association
CCPS:	Center for Chemical Process Safety (American Institute of Chemical Engineers, AIChE)
CEFIC:	Conseil Européen des Fédérations de l'Industrie Chimique (European Chemical Industry Council)
CEITs:	Countries with economies in transition
CETDG:	Committee of Experts on Transport of Dangerous Goods (UN)
CIA:	(UK) Chemical Industries Association
CLC:	International Convention on Civil Liability for Oil Pollution Damage
EC:	European Commission
EEB:	European Environmental Bureau
EFCE:	European Federation of Chemical Engineering
EPA:	(US) Environmental Protection Agency
EPSC:	European Process Safety Centre
EU:	European Union
FAO:	Food and Agriculture Organization of the UN
GHS:	Globally Harmonized System for the Classification and Labelling of Chemicals
GRI:	Global Reporting Initiative
HSE:	(UK) Health and Safety Executive
IAEA:	International Atomic Energy Agency
IAPH:	International Association of Ports and Harbors
IBC:	International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
ICAO:	International Civil Aviation Organization
ICCA:	International Council of Chemical Associations
ICDO:	International Civil Defence Organisation

ICEM:	International Federation of Chemical, Energy, Mine and General Workers' Union
ICFTU:	International Confederation of Free Trade Unions
IChemE:	(UK) Institute of Chemical Engineers
IFCS:	Intergovernmental Forum on Chemical Safety
IGC:	International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
IGO:	Inter-governmental organisation
ILO:	International Labour Organization
IMDG:	International Maritime Dangerous Goods Code
IMO:	International Maritime Organization
IOCC:	Inter-Organization Coordinating Committee
IOMC:	Inter-Organization Programme for the Sound Management of Chemical
IPCS:	International Programme on Chemical Safety
ISGOTT:	International Safety Guide for Oil Tankers and Terminals
JRC:	Joint Research Centre (EC)
MAHB:	Major Accidents Hazards Bureau (JRC - EC)
MARPOL:	International Convention for the Prevention of Pollution from Ships
MARS:	Major Accident Reporting System (EC)
MSDS:	Material safety data sheet
NGO:	Non-governmental organisation
OCHA:	Office for the Coordination of Humanitarian Affairs (UN)
OECD:	Organisation for Economic Co-operation and Development
OECD/NEA:	OECD Nuclear Energy Agency
OPRC:	International Convention on Oil Pollution Preparedness, Response and Co-operation
OSHA:	(US) Occupational Safety and Health Administration
PIANC:	Permanent International Association of Navigation Congress
PIC:	Poison information centre
QA:	Quality Assurance
QRA:	Quantitative Risk Assessment
REMPEC:	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (UNEP/IMO)
RID:	Regulations concerning the International Carriage of Dangerous Goods by Rail (UN/ECE)
RTDG:	Recommendations on the Transport of Dangerous Goods (UN)
SHE:	Safety, health and environment
SMEs:	Small and medium-sized enterprises
SOLAS:	International Convention for the Safety of Life at Sea
TQM:	Total Quality Management
TUAC:	Trade Union Advisory Committee to OECD
UN:	United Nations
UNECE:	UN Economic Commission for Europe
UNEP:	UN Environment Programme
UNEP DTIE:	UNEP Division of Technology, Industry and Economics
UNIDO:	UN Industrial Development Organization
UNITAR:	UN Institute for Training and Research

WHO: World Health Organization
WWW: World-wide Web

ANNEX III

KEY WORD INDEX

This Key Word Index has been designed to help the reader locate paragraphs that include reference(s) to a particular subject or stakeholder. This is not a topic index; the paragraphs identified simply contain the key word.

The cross-references in this Annex refer to related (although not necessarily identical) concepts. In using the Index, it should be kept in mind that slightly different terms are sometimes used in different parts of the Guiding Principles, even when the same or a closely related topic is addressed.

The references are to paragraphs in Parts A – E. The index does not include references to the introductory sections of the Guiding Principles, nor to the other Annexes. It also does not include references to explanatory text in Parts A – E of the Guiding Principles (i.e., the italicised text at the beginning of some sections). Finally, the key word index does not refer to the Golden Rules, except to mention them in the entries for the primary stakeholders addressed.

Academia or **Academic institution** (see also Research):
3b.2; section 4c; text box on Research (chapter 4); 5c.10; 15d.1; 16c.31

Acceptability/tolerability of risk:
1.18; 3b.2; text box on Research (chapter 4); 5d.8; 7.11; 16b.12

Accident scenarios (see also Worst-case scenario)**:**
2b.6; 2c.6; 5a.2; 5a.11; 5a.13; 5a.15; 5b.1; 5b.8; 5c.3; 6.4; textbox on Incident Investigation (chapter 15)

Acute exposure:
2b.3; text box on Research (chapter 4); 5a.2 (fn); 5c.11; 10.4; 10.9; 12.2; 13.3; 13.3(fn)

Acute exposure limits (or acute exposure guideline limits):
text box on Research (chapter 4); 5a.2 (fn); 13.3(fn)

Affiliate(s) (or affiliated operations):
2i.11 – 2i.18, 16c.18; 16c.19

Aid agencies (or donors):
16b.2 – 10; 16b.16; 16b.17; 16c.25

Audit (see also Inspection):
1.19; 2a.15; 2c.7; 2d.21; 2g.1 – 14; 2i.16; text box on GRI (chapter 2); 3a.21; 3c.1; 3c.4; 3c.8; 3c.13; 17b.10; 17c.3

Change: see Management of change

Communication (general):
1.4; 2a.1; 2a.2; 2a.9; 2a.17; 2b.4; 2d.17; 2d.23; 2d25; 2d.26; 2d.36; 2d.39; 2e.1; 3b.4; 3c.12; 3c.13; 4a.3; 4b.1; 5a.4; 5a.8; 5a.10; 5a.11; 5a.14; 5a.16; 5a.18; 5a.19; 5b.2; 5b.5; 5c.5; 5c.11; 5c.20; 5d.3; 5d.6; textbox on ER

for Medical Facilities (chapter 5); text boxes on APELL (chapters 5 & 16); 7.6; 7.7; 7.8; 7.10; 7.13; 7.17; 8.4; 11.1; 15a.11; 16a.3; 16a.4; 16c.5; 17a.15; 17b.1; 17c.6

Communication with the public: see Public information/communication

Community(ies) (see also Public):
1.2; 1.7; 1.15; 1.18; 1.19; 2c.3; 2c.13; 2g.5; 2i.8; 2i.16; 3a.4; 3a.21; 3b.3; section 4a; text box on Community Representation (chapter 4); 5a.9; 5a.12; 5a.14; 5a.19; 5b.2; 5b.9; 5c.2; 5c.8; 5c.11; 5c.17; 5c.18; 5c.21; 5d.1-5; 5d.8; textboxes on APELL (chapters 5 & 16); 7.1; 7.2; 7.5; 7.6; 7.10 – 12; 7.17; 10.7; 10.10; 10.12; 10.16; 10.19; 11c.1; 15d.1; 16a.6; 16b.2; 16b.5; 16b.18; 16c.16; 16c.17; 16c.26; 16c.41 [see also "Golden Rules"]

Consequence(s):
2a.16; 2b.7; 2c.2; 2i.14; 3a.1; 3a.2; 3a.12; 3a.13; 5a.3; 5b.1; 5c.23; 6.4; 10.1; 10.11; 11c.1; 12.1; 12.2; 13.2; 14b.2; 15a.1; 16b.5, 17a.12, 17c.1,

Construction: see Design/engineering/construction

Contingency planner: see Planner

Contingency planning: see Emergency planning

Contractors:
1.2; 1.7; 1.9; 2a.18; 2c.18; 2c.21; 2d.1; 2.d2; 2d.15; 2d.16; 2d.20; 2d.25; 2d.26; 2d.33; 2d.34; 2d.40; 2d.43; 2e.1; 2f.5; 2h.1; 2i.1; 2i.5; 2i.10; 5b.2 (fn); 14c.3; 16c.17; 17a.4; 17a.7; 17a.8

Control framework:
1.12; 3a.2; 3a.4; 3a.6; 3a.7; 3a.16; 15c.1; 16c.2; 16c.34; 17a.13

Corporate safety culture: see Safety culture

Decommission (an installation) (see also Shut-down):
2a.1; 2a.15; 2d.43; 2h.1; 3c.1; 17c.3

Demolition (of an installation):
2a.1; 2h.1; 3c.1

Design/engineering/construction (of a hazardous installation):
2a.1; 2a.15; 2b.8; 2c.2; 2c.4 – 2c.21; 2d.2; 2d.5; 2d.17; 2d.21; 2d.42; 2d.43; 2e.1; 2f.1; 2g.11; 2i.10; 3a.16; 3c.1; textbox on Incident Investigations (chapter 15); 16c.1 – 4; 16c.9; 16c.11; 16c.12; 16c.16; 17a.1; 17a.7; 17c.1; 17c.3; 17c.7

Documentation (or documents):
2a.7; 2a.17; 2c.11; 2c.17; 2c.18; 2f.1; 2f.2; 2g.3; 2i.10; 3c.1; 3c.4; 3c.9; 4e.3; 5c.13; 10.19; 12.2; 14b.2; 15a.4; 15a.5; 15b.1; 15c.1; textbox on Incident Investigations (chapter 15); 16b.2; 16b.8; 16c.9; 17a.3; 17a.10; textbox on Transport Interfaces (chapter 17)

Domino effect:
2c.13; 2c.14; 3b.3; 5a.4; 5b.10; 16c.9; 17b.1

Education: see Training/education

Emergency plan(ning):
- in general: 2a.15; 2c.11; 3a.10; 3a.13; 3a.15; 5a.1 – 7; 5a.9 – 16; 5a.18; 5a.19; 5a.20; 5b.1; 5b.2; 5b.3; 5b.8; 5b.10; 5c1 – 8; 5c.10 –16; 5c.18; 5c.20; 5c.21; 5c.23; 5d.1; 5d.2; 5d.4 – 7; textbox on EP for Medical Facilities

(chapter 5); textbox on APELL (chapter 5); 7.4; 7.13; 7.15; 8.1; 8.2; 9.1; 9.2; 9.3; 10.1; 10.3; 10.10; 10.12; 10.14; 10.16; 10.17; 10.19; 11a.2; 11c.1; 15c.3; 16a.1; 16a.3; 16a.4; 16b.1; 16c.26; 16c.34; 16c.35; textbox on APELL (chapter 16); 17a.14; 17b.1; 17b.11; 17b.13; 17c.5

- off-site: 2a.17; 5a.1; 5a.5; 5a.6; 5a.10; 5a.12; 5b.1; 5b.2; 5b.3; 5b.8; 5b.10; 5c.1; 5c.2; 5d.1; 5d.2; 9.1; 17a.14

- on-site: 2a.17; 5a.1; 5a.5; 5a.6; 5a.10; 5a.12; 5b.1; 5b.2; 5b.8; 5c.1; 5c.2; 5c.3; 5c.5; 5c.13; 5d.1; 5d.2; 5d.4; 7.4; 7.15; 9.2; 16a.1; 16a.3; 16a.4; 16c.26; 17a.14

Emergency responders: see Response personnel

Employee(s) (see also Labour; see also Personnel; see also Worker(s)):
1.2; 1.9; 1.11; 1.13; 2a.1 – 5; 2a.8; 2a.9; 2a.10; 2a.12; 2a.14; 2b.5; 2c.6; 2c.7; 2.c.9; 2c.16; 2c.18; 2d.1; 2d.2; 2d.5; 2d.6; 2d.10; 2d.14; 2d.17; 2d.18; 2d.20 – 26; 2d.28 – 35; 2d.38; 2d.39; 2d.41; 2d.43 – 45; 2f.4; 2g.4; 2g.10; 2i.7; 2i.9; 2i.12; 2i.16; 3a.4; 3c.3; 3c.12; 3c.13; 4b.1; 5a.19; 5b.1-3; 5b.9; 5c.2; 5c.11; 5d.5; 7.12; 9.2; 10.2; 14c.3; 15a.3; 15b.1; 15b.3; 16c.5; 16c.9; 16c.17; 16c.24; 16c.25; 16c.28; 16c.29; 16c.32; 16c.39; 17a.4; 17a.7

Employee representative or **Labour representative** or **Safety Representative** (see also Union):
1.2; 2a.3; 2a.10; 2a.12; 2a.14; 2c.16; 2d.6; 2d.10; 2d.26; 2d.28; 2d.30; 2d.34; 2d.38; 2d.44; 2g.2; 2g.13; 2i.9; 2i.12; 4b.1; 5a.19; 5d.5; 5d.6; 14c.3; 15a.3; 15b.3

Enforcement:
1.12; 1.14; 3a.7; 3a.21; 3b.1; 3c.2; 3c.9; 3c.13; 6.3; 9.2; 15c.1; 17a.6; 17a.13; 17b.1

Engineering design: see Design/engineering/construction

Enterprise(s) (see also Industry; see also Management; see also Producers):
1.3; 1.4; 1.13; 1.15; 1.19; textbox on SMEs (chapter 1); 2a.1; 2a.2; 2a.6; 2a.7; 2a.9; 2a.10; 2a.12 – 14; 2a.17; 2b.9; 2c.1; 2c.2; 2c.5; 2c.6; 2c.11; 2c.13; 2c.20; 2c.21; 2d.1; 2d.2; 2d.15; 2d.16; 2d.23; 2d.24; 2d.26; 2d.44; 2d.45; 2g.2; 2g.4; 2g.8 – 10; 2g.14; 2i.2 – 7; 2i.11 – 18; 3a.3; 3a.5; 3a.8; 3a.21; 3b.2; 3c.1; 3c.10; 3c.13; 4b.1; 5a.14; 5b.1; 5b.2; 5b.5; 5b.10; 5c.3; 5c.6; 7.4; 9.3; 10.2; 10.19; 14a.1; 14b.2; 14c.2; 14c.3; 15a.12; 15b.3; 15b.4; 15d.2; textbox on Incident Investigations (chapter 15); 16b.9; 16b.14; 16c.1; 16c.2; 16c.4; 16c.12; 16c.15 – 21; 16c.26; 16c.27; 16c.28; 16c.30; 16c.34

Exercise/Test (for emergency planning):
2a.15; 2d.37; 5a.12; 5a.18; 5c.2; 5c.8; 5d.4; 5d.5; 17c.3

Firefighters: see Public authorities; see Emergency responders

Hazard (analysis, assessment, evaluation, identification or study) (see also Risk assessment):
2a.15; 2a.16; 2a.17; 2b.1; 2b.4; 2b.7; 2c.6; 2c.17; 2c.18; 2d.16; 2d.20; 2d.34; 2d.43; 2e.1; 2f.1; 2f.2; 2g.2; 2g.10; 2g.11; 2h.1; 2i.1; 2i.8; 2i.11; 3a.12; 3b.2; 3c.8; 3c.10; 4a.3; 5a.3; 5b.1; 5b.8; 6.1; 7.1; 10.10; 14c.3; 16c.3; 16c.8; 16c.9; 16c.27; 17a.5; 17a.15; 17a.20; 17c.2; 17c.5

Health/Medical Personnel:
5a.8; 5a.9; 5c.7; 5c.8; 5c.18; textbox on EP for Medical Facilities (chapter 5)10.2; 10.4; 10.8; 10.13; 10.15; 13.4

Human factors or **Human error**:
1.17; 2b.3; 2b.6; 2c.4; 2c.6; 2c.9; 2d.42 – 46; 5a.12; textbox on Incident Investigations (chapter 15); 17a.7

Industry (see also Enterprise, see also Management, see also Producers):
1.2; 1.3; 1.6; 1.13; 1.17; 1.19; 2a.17; 2c.5; 2g.1; 2g.4; 2g.6; 2g.14; 2i.3 – 6; 3a.4; 3a.5; 3a.6; 3a.9; 3a.12; 3a.16; 3a.20; 3a.21; 3c.1; 3c.3; 3c.12; 3c.13; 3c.14; 4a.1; 4a.2; 5a.7; 5a.8; 5a.9; 5a.12; 5a.20; 5b.1; 5b.5; 5b.9; 5c.17;

5d.3; 7.11; 7.13; 8.4; 10.9; 14a.1; 14b.2; 14b.3; 14c.5; 15a.1; 15a.10; 15a.12; 16b.2; 16b.8; 16b.9; 16b.18; 16c.5; 16c.24; 16c.26; 16c.31; 16c.32; 16c.34; 16c.39; 16c.41; textbox on Intergovernmental Organisations (chapter 16); 17a.15; 17a.18; 17c3; 17c.5; 17c.6; 17c.7 [see also "Golden Rules"]

Industry association or **Trade association**:
1.17; 1.19; textbox on SMEs (chapter 1); 2c.5; 2i.4; 2i.5; 2i.6; textbox on Responsible Care (chapter 2); 3a.4; 14c.4; 15a.10; 15a.12; 16b.9; 16c.9; 16c.24

Inherent safety:
2c.4; 2c.6 – 8; 3a.9

Inspection or **Inspect** (installations) (see also Audit):
1.12; 1.14; 2c.14; 2c.17; 2c.18; 2d.17; 2d.44; 2e.1; 2e.2; 2f.1; 2g.1; 2g.3; 2g.6; 2g.7; 3a.12; 3c.1; 3c.3 – 13; 10.18; 15c.1; textbox on Incident Investigations (chapter 15); 17a.1; 17a.13; 17b.10; 17c.4

International (or intergovernmental) organisations:
2d.19; 4b.3; 4d; 5d.5; 5d.7; 16b.3; 16b.8; 16b.15; 16c.6; 16c.24; 16c.34; textbox on Intergovernmental Organisations (chapter 16); 17b.3

Investigation(s):
2a.2; 2a.15; 2d.31; 2d.36; 2g.2; 2i.18; 10.19; 14b.2; 15a.1 – 14; 15b.1 – 4; 15c.1 – 5; 15d.1; 15d.2; textbox on Incident Investigations (chapter 15); 17c.3

Insurance:
2a.14; 2g.9; 15d.2

Labour: (see also Employee; see also Personnel; see also Worker):
1.19; textbox on SMEs (chapter 1); 2a.10; 2a.12; 2b.8; 2d.1; 2d.6; 2d.17 – 19; 2d.25; 2d.26; 2d.28; 2d.34; 2d.35; 2d.38; 2d.43; 2f.2; 2g.2; 2g.10; 2g.13; 4b.1; 4b.2; 5d.5; 5d.6; 5d.7; 15b.3; 16b.2; 16b.18; 16c.2 [see also "Golden Rules"]

Labour organisation(s) (see also Union):
1.19; 4b.1 – 4b.3; 5d.5; 5d.6; 5d.7

Labour representative: see Employee representative; see Union

Land-use (planning and/or policies) (see also Siting):
2c.1 – 3; 3a.10; 3b1 – 4; 4e.3; textbox on Research (chapter 4); 5.2(fn); 6.1; 6.2; 6.3; 6.4; 6.5; 6.6; 13.3(fn); 16a.2; 16b.8; 16c.2; 16c.20; 16c.34; 16c.35; 17a.1; 17c.2

Local authorities (or officials): see Public authorities

Maintenance:
2a.1; 2a.5; 2a.15; 2c.7; 2c.17; 2c.18; 2d.2; 2d.9; 2d.21; 2d.43; 2d.46; 2e.1; 2e.2; 2g.11; 2i.13; 3c.1; 15a.3; 15a.4; textbox on Incident Investigations (chapter 15); 16b.6; 16c.3; 16c.9; 16c.12; 16c.21; 17a.10; 17b.5; 17c.2; 17c.3; 17c.4

(Management of) change:
2a.15; 2b.8; 2c.7; 2d.2; 2d.38; 2f.1; 2f.2; 3a.16; 5a.12; 5c.8; 5c.18; 6.4; 15b.3; textbox on Incident Investigations (chapter 15); 16c.29; 16c.36

Managers/Management (of hazardous installations) (see also Industry):
1.2; 1.5 – 1.9; 1.13; 1.14; textbox on SMES (chapter 1); 2a.1; 2a.2; 2a.4; 2a.5; 2a.6; 2a.8, 2a.9, 2a.10; 2a.12; 2a.14; 2a.16; 2b.1; 2b.2; 2b.7; 2b.8; 2c.1; 2c.2; 2c.3; 2c.12; 2c.13; 2c.17; 2c.18; 2c.21; 2d.1; 2d.2; 2d.5; 2d.7;

2d.9; 2d.10; 2d.11; 2d.13; 2d.15; 2d.17 – 20; 2d.22 – 26; 2d.28 – 31; 2d.33 – 36; 2d.38; 2d.39; 2d.40; 2d.43; 2d.45; 2e.1; 2e.2; 2f.1; 2f.2; 2f.3; 2f.5; 2g.2; 2g.8; 2g.9; 2g.10; 2h.1; 2i.7; 2i.18; 3a.4; 3a.12; 3a.14; 3a.19; 3b.2; 3c.5; 3c.13; 4b.1; 4b.2; 5a.1; 5b.1; 5b.3; 5b.6; 5b.8; 5b.9; 5c.2; 5c.5; 5c.16; 5d.5; 5d.6; 5d.7; 9.1; 9.2; 10.2; 12.1; 14a.1; 14b.2; 14c.1; 14c.2; 14c.3; 15a.1; 15a.2; 15a.12; 15b.1 – 4; 15c.3; textbox on Incident Investigations (chapter 15); 16b.5; 16c.1; 16c.5; 16c.17; 16c.23 – 26; 16c.28; 16c.29; 16c.32; 16c.37; 16c.39; 17a.5; 17a.6; 17a.8; 17a.9; 17a.13; 17a.15; 17a.16; 17a.20 [see also "Golden Rules"]

Ministry: see Public authorities

Modification:
2c.2; 2c.4; 2c.5; 2c.15; 2c.18; 2d.2; 2d.46; 2f.1; 2f.3 – 5; 3a.14; 3b.2; 16c.12; 16c.29; 16c.39

Monitor: see Inspections; see Audits

Mutual aid or **Mutual assistance** (see also Transboundary co-operation)**:**
1.19, textbox on SMEs (chapter 1); 5a.14; 5b.10; 16a.8; 16c.41

Near-miss:
1.4(fn); 1.9; 2a.2; 2a.3; 2d.44; 3a.19; 5a.12; 14a.1; 14b.2; 14b.3; 14c.2; 14c.3; 15a.5; 15a.12; 15b.1; 15b.2; 15b.3; 16c.13; 17a.16; 17c.7

NGO (non-governmental organisation):
1.6; textbox on SMEs (chapter 1); 3b.2; 4e.1 – 4; textbox on Community Representation (chapter 4); 5d.8; 11c.1; 15d.1

Notification of incidents: see Reporting (of incidents)

Off-site emergency plan: see Emergency plan

Officials: see Public authorities

On-site emergency plan: see Emergency plan

Operating procedures: see Procedures

Personnel (see also Employees; see also Labour; see also Worker)**:**
1.13; 2a.1; 2a.4; 2a.14; 2a.15; 2a.17; 2b.5; 2c.7; 2c.10; 2c.13; 2c.14; 2c.16; 2c.18; 2d.3; 2d.11; 2d.22; 2d.23; 2d.40; 2d.45; 2f.4; 2g.3; 2g.5; 3c.4; 3c.11; 5a.9; 5a.12; 5a.15; 5a.16; 5a.17; 5b.2; 5c.5 – 8; 5c.11; 5c.13; 5c.15; 5c.17; textbox on EP for Medical Facilities (chapter 5); 7.14; 8.1; 9.2; 10.2; 10.4; 10.5; 10.6; 10.8 – 11; 10.13; 10.15 – 19; 11c.1; 12.1; 14b.2; 15a.12; 16a.6; 16c.24; 16c.39; 16c.41; 17a.3; 17a.14; 17a.16; 17c.2

Pipelines:
5b.8; 17a(fn); 17a.7; 17a.19; 17b(fn) 17c(fn), 17c.1 – 7

Planning: see Emergency Planning

Plant managers: see Managers

Police: see Public authorities

Port area:
5b.10; 17b.1 – 6; 17b.11 – 14

Preparedness: see Emergency planning

Procedures:
1.7; 2a.1 – 4; 2a.13; 2a.14; 2a.15; 2a.17; 2c.4; 2c.6; 2c.7; 2c.8; 2c.11; 2c.14; 2c.17; 2d.2 – 6; 2d.9; 2d.20; 2d.24; 2d.34; 2d.36; 2d.38; 2d.42; 2e.1; 2f.1; 2f.2; 2f.3; 2f.5; 2g.2; 2g.8; 2g.10; 2h.1; 2i.7; 2i.10; 3c.3; 3c.12; textbox on Research (chapter 4); 5a.1; 5a.17; 5b.3; 5c.3; 5c.8; 5c.12; 5c.13; 5c.15; 5c.22; textbox on EP for Medical Facilities (chapter 5); textbox on APELL (chapter 5); 6.4; 7.15; 10.21; 13.1; 14b.2; 14c.1; 14c.3; 15a.2; 15b.1; 15b.3; textbox on Incident Investigations (chapter 15); 16a.4; 16a.6; 16a.8; 16b.5; 16b.12; 16b.16; 16c.1; 16c.12; 16c.25; 16c.29; 16c.33; 16c.40; 17a.6; 17a.8; 17a.11; 17b.2; 17b.5; 17b.12; 17c.3

Producers (of hazardous substances):
1.3; 1.10; 2i.1

Product Stewardship:
1.10; 2i.1; 2i.5; 16c.24

Provincial authorities: see Public authorities

Public (not public authorities)(see also Community):
1.2; 1.12; 1.13; 2a.6; 2a.11; 2b.5; 2c.2; 2g.4; 2g.8; textbox on Responsible Care (chapter 2); 3a.4; 3a.12; 3a.14; 3a.20; 3c.1; 3c.3; 3c.13; 4a.1; 4a.3; 4e.2; 4e.4; 5a.2; 5a.5; 5a.7; 5a.12; 5a.18; 5a.19; 5b.1; 5b.5; 5b.9; 5c.5; 5c.8; 5c.20; 5c.23; 5d.3; 5d.8; 6.7; 7.1; 7.2; 7.3; 7.4; 7.5; 7.6; 7.8; 7.9; 7.11; 7.13; 7.14; 7.15; 7.17; 8.1; 8.4; 10.1; 10.2; 10.3; 10.8; 10.9; 11a.1; 11a.2; 11a.3; 11b.1; 11b.2; 14b.2; 15a.12; 15c.1; 15c.2; textbox on Incident Investigations (chapter 15); 16a.4; 16c.5; 16c.14; 16c.20; 16c.26; 16c.31; 16c.34; textbox on APELL (chapter 16); 17a.15; 17b.11 [see also "Golden Rules"]

Public authorities (see also Response personnel; see also Health/medical personnel):
- in general: 1.2; 1.6; 1.8; 1.12; 1.13; 1.14; 1.17; 1.19; textbox on SMEs (chapter 1); 2a.7; 2a.15; 2a.18; 2b.7; 2c.1; 2c.2; 2c.3; 2c.5; 2c.17; 2d.31; 2d.44; 2e.2; 2g.4; 2g.8; 2i.5; 2i.6; 2i.9; 2i.12; 3a.1 – 15; 3a.17 – 21; 3b.1 – 3b.4; 3c.1; 3c.2; 3c.3; 3c.5; 3c.6; 3c.8 – 14; 4a.1 – 3; 5a.1; 5a.7; 5a.9; 5a.12; 5a.14; 5a.19; 5a.20; 5b.1; 5b.2; 5b.8; 5b.9; 5c.1 – 5; 5c.9; 5c.10; 5c.13; 5c.15; 5c.16; 5c.17; 5c.20; 5c.22; 5d.3; textbox on EP for Medical Facilities (chapter 5); 6.1; 6.2; 6.4; 7.2; 7.9; 7.11; 7.13; 8.4; 9.2; 9.3; 10.9; 10.18; 10.21; 11a.2; 13.1; 14a.1; 14b.1; 14b.2; 14b.3; 14c.1; 15a.1; 15a.12; 15c.1 – 4; 16a.1; 16a.2; 16a.4; 16a.5; 16a.7; 16a.8; 16a.9; 16b.2; 16b.4; 16b.16; 16b.17; 16b.18; 16c.1; 16c.3; 16c.5; 16c.9; 16c.10; 16c.14; 16c,17; 16c.26; 16c.32 – 41; 17a.2; 17a.9; 17a.13; 17a.15; 17a,16; 17a.17; 17a.19; 17a.20; 17b.1; 17b.11; 17c.6; 17c.7; textbox on Transport Interfaces (chapter 17); [see also "Golden Rules"]

- firefighters/fire services: 2d.3; 2d.6; 5a.5; 5a.8; 5b.3; 5c.5; 5c.8; 5c.9; 10.9

- local authorities: 1.2; 1.15; textbox on SMEs (chapter 1); 2c.2; 2d.6; 2i.8; 3a.2; 3c.12; 5a.14; 5a.19; 5b.6; 5c.2; 6.2; 9.2; 10.9; 16c.5; 16c.12; 16c.26; 16c.35

- police: 5a.5; 5a.8; 5c.5; 5c.8; 10.9

- regional authorities: 1.2; 3c.12; 5c.2; 6.2; 10.7; 10.10; 10.18

(Public) information or **Risk communication**
1.12; 1.13; 2g.4; 3c.3; 4a.1; 4a.2; 4a.3; 4e.2; 5b.9; 5c.5; 5c.20; 5d.3; 5d.8; textbox on APELL (chapter 5); 7.5; 7.6; 7.9; 7.11; 16c.5

Public (or **community) participation** (public input into decisionmaking):
3a.4; 3a.14; 4a.1; textbox on Community Representation (chapter 4); 5a.5; 5c.2; 5d.1; 5d.4; 6.7; 7.11; 7.15; 16a.6; 16b.2

Regional authorities: see Public authorities

Regulations:
textbox on SMEs (chapter 1); 2a.7; 2b.9(fn); 2c.21; 2d.15; 2i.5; 3a.2; 3a.3; 3a.5; 3a.6; 3a.16; 3a.21; 3c.1; 3c.12; 3c.13; 14b.3; 15c.1; 15c.3; 16c.9; 16c.14; 17a.12; 17a.18(fn); 17a.19; 17b.1; 17b.8

Repairs (see also Maintenance):
2d.46; 2e.1; 2f.1; 2f.3; 17b.5

Reporting (or notification of incidents):
1.9; 2a.17; 2d.31; 2g.2; 3a.19; 5a.17; 8.1; 11a.3; 12.2; 14b.1; 14b.2; 14c.1; 14c.2; 14c.3; 14c.5; 15b.1; 16a.5; 17a.16; 17b.4; 17c.4

Research (see also Academia):
1.19; 2c.4; 2d.9; 2i.14; 3a.20; 4c; textbox on Research (chapter 4); 5a.15; 13.4; 16b.11, 16c.31

Response personnel or **Response authorities** or **Emergency responders**) (see also Public authorities) (see also Health/Medical personnel):
2a.17; 2b.5; 2d.3; 2d.6; 2g.5; 5a.5; 5a.8; 5a.9; 5a.12; 5a.15; 5a.17; 5a.19; 5b.2; 5b.3; 5b.8; 5c.5 – 11; 5c.15; 5c.23; 7.14; 8.1; 8.2; 9.2; 10.1; 10.2, 10.4 – 11; 10.16 – 19; 11c.1; 14b.2; 15a.4; 16c.41; 17a.3; 17a.14; 17a.16; 17c.2; 17c.5

Representative: see Employee representative

Risk acceptability/tolerability: see Acceptability/tolerability of risk

Risk assessment:
1.18; 2a.17; 2b1 – 9; 2c.2; 2d.21; 2d.43; 2i.8; 2i.12; 3a.13; 3b.2; text box on Research (chapter 4); 5a.3; 5c.8; 10.9; 15c.3; 17a.20; 17c.1; 17c.2; 17c.5

Risk communication: See Public information/Risk communication; see also Communication

Risk management:
2a.13; 2a.16 (fn); 2b.5; 3a.12 (fn); 15c.3

Safety committee:
2d.26; 2d.27, 5d.5

(corporate**) Safety culture**:
2a.1 – 3; 2a.6; 2a.7; 2a.14; 2c.7; 2d.23; 14c.3

(Safety) management system(s):
1.17; 2a.7; 2a.13 – 15; 2a.17; 2c.7; 2d.15; 2g.1; 2g.8; 3a.17; 3c.1; 15a.6; 16c.24; textbox on Intergovernmental Organisations (chapter 16); 17a.6; 17c.3

Safety policy:
2a.1; 2a.7 – 15; 2a.17; 2d.1; 16c.17; 16c.18

(Safety) report or **Safety reporting**:
2a.16 – 18; 2c.17; 2g.2; 3a.12; 3a.15; 3b.2; 3c.1; text box on GRI (chapter 2); 5b.1; 17a.5

Safety representative: see Employee representative

Scenario: see Accident scenario

Shutdown (see also Decommission):
2d.43; 2e.1; 2e.2; 2h.1; 3c.9; 5b.1; 5b.2; 17a.7; 17c.1

Siting (see also Land use):
2c.1 – 3; 3a.14; 3b.1; 3c.1; 16a.6; 16b.8; 16c.14; 16c.20; 17a.1

SMEs (small and medium-sized enterprises):
1.13; 1.15; 1.19; text box on SMEs (chapter 1); 2g.9; 2i.2; 2i.6; 3a.6; 3a.13; 3a.15; 3a.21; 5b.1; 5c.3

States: see Public authorities

Storage (of hazardous substances) (see also Warehouse):
1.3; 2a.7; 2a.15; 2c.2; 2c.4; 2c.14; 2c.17; 2d.6; 2d.8; 2d.20; 2i.1; 2i.15; 5b.1; 5b.8; 16c.9; 17a(fn); 17a.11; 17a.12

Start-up (of an installation):
2a.15; 2c.17; 2c.18; 2c.19; 2d.11; 2d.46; 2e.1; 2f.3; 3a.14; 16c.11; 16c.12; 16c.13

Supplier (of hazardous substance or hazardous installation):
1.19; text box on SMEs (chapter 1); 2c.20; 2d.6; 2i.2; 2i.5; 2i.6; 2i.7; 2i.8; 5b.1; 16c.3; 16c.7 – 14; 16c.24; 16c.25; 16c.33; 16c.36

Technology transfer or **Transfer of technology**:
2d.9; 2i.7 – 10; 16b.14; 16c.1 – 4; 16c.6; 16c.7; 16c.9; 16c.10; 16c.12; 16c.13; 16c.14; 16c.27; 16c.33; 16c.34; 16c.36; 16c.38; textbox on Intergovernmental Organisations (chapter 16)

Test: see Exercise

Tolerability: see Acceptability

Trade association: see Industry association

Trade union: see Union

Training/education:
1.6; 1.19; 2a.4; 2a.10; 2a.15; 2b.9; 2c.7; 2c.9; 2c.10; 2c.11; 2c.17; 2d.2; 2d.5; 2d.6; 2d.17; 2d.21; 2d.23; 2d.24; 2d.26; 2d.28; 2d.34 – 43; 3a.18; 3a.20; 3a.21; 3c.4; 3c.8; 3c.11; 3c.12; 4a.3; 4b.1; 5a.11; 5a.12; 5a.19; 5b.9; 5c.8; 5c.18; 5c.20; 5d.6; 5d.8; 6.5; 7.5; 7.8; 7.9; 7.12; 7.14; 10.8; 10.16; 12.1; 14c.3; 15a.4; 15a.11; 15a.12; 15b.3; textbox on Incident Investigations (chapter 15); 16b.2; 16b.4; 16b.5; 16b.6; 16b.8; 16b.12; 16c.1; 16c.9; 16c.11; 16c.12; 16c.16; 16c.21; 16c.24; 16c.29; 16c.31; 16c.39; 16c.40; 16c.41; 17a.4; 17a.7; 17c.3

Transboundary:
- co-operation (see also mutual aid): 5a.14; 5a.20; 5c.21; 7.16; 16a.14; 16b.1; 16c.41
- effects of accident: 3a.11(fn); 5c.21; 16a.1; 16a.2; 16a.3; 16a.4; 16a.5; 16a.6

Transport (related to hazardous substances):
1.3; 2a.15; 2b.8; 2c.1; 2c.4; 2c.6; 2c.15; 2d.33; 2i.1, text box on Research (chapter 4); 5a.1; 5a.2; 5a.4; 5a.9; 5a.12; 5b.8; 17a.1 – 21; 17b.8; 17c.1; 17c.6; 17c.7; textbox on Transport Interfaces (chapter 17)

Transport interface(s):
17a (fn); 17a.1; 17a.2; 17a.5 – 9; 17a.11 – 16; 17a.18; 17a.19; textbox on Transport Interfaces (chapter 17)

Union(s) (see also Labour organisation; see also Employee representative):
1.2(fn); 1.19; text box on SMEs (chapter 1); 2d.19; 3a.4; 4b.1; 16b.8

Warehouse (see also Storage):
2d.6; text box on APELL (chapter 16); 17a (fn)

Warning systems:
5a.18; 7.2; 8.1; 11a.1; 12.1

Worker (see also Employee; see also Labour; see also Personnel):
2d.39; 5c.2; 10.2; 17a.7; textbox on Transport Interfaces (chapter 17)

Worst-case scenario:
5a.2; 5a.11; 5a.13; 5b.1

ANNEX IV

SELECTED REFERENCES

This Annex provides a list of websites and publications that might be of interest to the readers of the Guiding Principles. It also contains a list of relevant legal instruments, many of which are referenced in the Guiding Principles. In addition, this Annex contains a full list of the OECD Workshops and Special Sessions that have provided input for these Guiding Principles.

These lists are NOT intended to be comprehensive; rather, they were developed from suggestions by the OECD Working Group on Chemical Accidents and the Drafting Group. The purpose was to indicate materials that are relevant (especially those that give further guidance on implementing the Guiding Principles) and that are easily available to the public. Most of the publications and websites are available in either English or French (or both).

WEBSITES

OECD *Member Countries*

Germany
- www.umweltbundesamt.de
- www.bmu.de
- www.lfu.baden-wuerttemberg.de

Belgium
- www.meta.fgov.be

Canada
- www.ec.gc.ca/ee-ue

Czech Republic
- www.env.cz
- www.vubp.cz
- www.bozpinfo.cz

Finland
- www.intermin.fi/sm/pelastus/esite/esite_frame.html

France
- http://www.environnement.gouv.fr
- http://www.aria.environnement.gouv.fr

Hungary
- www.ktm.hu

Italy
- www.ispesl.it

Korea
www.kosha.net

Mexico
www.semarnat.gob.mx

Netherlands
www.vrom.nl

Norway
www.dbe.no

Slovak Republic
www.enviro.gov.sk

Sweden
www.srv.se
www.av.se
www.environ.se

Switzerland
www.umwelt-schweiz.ch

United Kingdom
www.hse.gov.uk (Health and Safety Executive)
www.environment-agency.gov.uk (UK Environment Agency)
www.sepa.org.uk (Scottish Environment Protection Agency)

United States
http://yosemite.epa.gov/oswer/ceppoweb.nsf/content/index.html
www.csb.gov

International Organisations

European Commission
http://europa.eu.int/comm/environment/civil
http://mahbsrv.jrc.it/

International Labour Organization
www.ilo.org/public/english/protection/safework/index.htm

International Maritime Organization
www.imo.org/home.asp

International Programme on Chemical Safety
www.who.int/pcs

Office for the Coordination of Humanitarian Affairs
www.reliefweb.int/ochaunep/ (Joint UNEP/OCHA Environment Unit)

Organisation for Economic Co-operation and Development
www.oecd.org/env/accidents

UN *Economic Commission for Europe*
www.unece.org/env/teia/welcome.html

UN *Environment Programme*
www.uneptie.org/pc/apell (APELL)
www.unep.org/DEPI/disastermanagement.asp (Environmental Policy Implementation)
www.reliefweb.int/ochaunep/ (Joint UNEP/OCHA Environment Unit)

World Health Organization
www.who.int

Industry Organisations

American Chemistry Council
www.americanchemistry.com

Center for Chemical Process Safety (*American Institute of Chemical Engineers*)
www.aiche.org/ccps/

European Chemical Industry Council (CEFIC)
www.cefic.org

European Process Safety Centre
http://www.epsc.org/

International Council of Chemical Associations
www.icca-chem.org

Kemikontoret (*Association of Swedish Chemical Industries*)
www.chemind.se/Kemikontoret/main.htm

Labour Organisations

International Federation of Chemical, Energy, Mine and General Workers' Union
www.icem.org

Other Non-governmental Organisations

Clary-Meuser Research Network
http://www.mapcruzin.com/
http://www.mapcruzin.com/rmp_maps/rmp_resources.htm

European Environmental Bureau
www.eeb.org

Greenpeace
http://www.greenpeaceusa.org

Right to Know Network
http://www.rtk.net/

US *Public Interest Research Groups*
http://www.pirg.org

Academia

*University of Bordeaux*1 (*France*)
http://portaildurisque.iut.u-bordeaux1.fr (Institut Universitaire de Technology)

The Wharton School of the University of Pennsylvania (US)
http://grace.wharton.upenn.edu/risk/ (Risk Management and Decision Processes Center)

PUBLICATIONS

General

European Environment Agency (1999), *Environment in the European Union at the Turn of the Century* (Chapter 3.8), Copenhagen.

EC Joint Research Centre (1997), *Guidance on the Preparation of a Safety Report to Meet the Requirements of Council Directive* 96/82/EC (*Seveso* II), Luxembourg, ISBN 92-828-1451-3.

EC Joint Research Centre (1998), *Lessons Learnt from Accidents: Proceedings of a Seminar held on* 16 –17 *October* 1997, Luxembourg, ISBN 92-828-2845-x.

EC Joint Research Centre (1998), *Guidelines on a Major Accident Prevention Policy and Safety Management System, as required by Council Directive* 96/82/EC (*Seveso* II), Luxembourg, ISBN 92-828-4664-4.

ICFTU (1986), *Is There a Bhopal Near You? Unions Drive to Prevent Chemical Disasters Worldwide. Trade Union Principles for the Prevention of Chemical Disasters*, Brussels.

ICFTU/ICEF (1985), *Trade Union Report on Bhopal*, available at www.Bhopal.net.

ILO (1991), *Prevention of Major Accident Hazards* (an ILO Code of Practice), Geneva.

ILO (1988), *Major Hazard Control: a practical manual*, Geneva.

UNEP (1988), APELL *Handbook: Awareness and Preparedness for Emergencies at Local Level*: A *Process for Responding to Technological Accidents*, ISBN 92-807-1183-0.

UNEP (1990), APELL *Storage of Hazardous Materials*: A *Technical Guide for Safe Warehousing of Hazardous Materials*, ISBN 92-807-1238-1.

UNEP (1994), *Annotated* APELL *Bibliography*, ISBN 92-807-1411-2.

UNEP (1995), APELL *Worldwide*, ISBN 92-807-1527-5.

UNEP (2001), APELL *for Mining: Guidance for the Mining Industry in Raising Awareness and Preparedness for Emergencies at Local Level*, ISBN 92-807-2035.

UK (1999), A *Guide to the Control of Major Accident Hazards Regulations* (*implementing Seveso* II *in Great Britain*), ISBN 0-7176-1604-5 (L111).

US EPA (1998), *Risk Management Program*: RMP*S*ubmit* RMP**Info*, available at: www.epa.gov/ceppo/factsheets/rmpfact3.pdf.

US EPA (1999), *Chemicals in Your Community*, available at: www.epa.gov/ceppo/pubs/chem-in-comm.pdf.

US EPA (1999), *Guidance for Auditing Risk Management Plans* (RMPs), available at: www.epa.gov/ceppo/pubs/audit_gd.pdf.

Journal of Hazardous Materials (1999), Various authors/articles related to *The* SEVESO II D*irective* (96/82/EC) *on the control of major accident hazards involving dangerous substances*, Vol. 65, n°1-2, Elsevier Science.

Journal of Loss Prevention in the Process Industries (1999),Various authors/articles related to I*nternational Trends in Major Accidents and Activities by the European Commission towards Accident Prevention*, Vol. 12 No 1, Elsevier Science.

Prevention

EC Joint Research Centre (1999), *Guidance on Inspections as required by Article 18 of the Council Directive* 96/82/EC (*Seveso* II), Luxembourg, ISBN 92-828-5898-7.

EPSC (1996), *Safety Performance Measurement*, edited by Jacques van Steen, ISBN 0 85295 382 8.

OECD (2003), *Guidance for Safety Performance Indicators*, (to be published in 2003).

US EPA (1996), *Chemical Accident Prevention and the Clean Air Act Amendments of* 1990, available at: www.epa.gov/ceppo/factsheets/caa-gnrl.pdf.

US EPA (1996), *Risk Management Program*: *Accidental Release Prevention*, available at: www.epa.gov/ceppo/factsheets/rmp-fs.pdf.

US EPA (1996), *Risk Management Planning*: *Accidental Release Prevention*; *Final Rule*: *Clean Air Act section* 112(*r*), available at: www.epa.gov/ceppo/factsheets/rmprule.pdf.

Small and Medium-Sized Enterprises

OECD (2001), *Chemical Hazards and their Control in Small and Medium-Sized Enterprises* (SMEs) – *an Approach to Hazard Reduction*, Paris, (a brochure).

Hazard and Risk Assessment

AIChE, Center for Chemical Process Safety (1999), *Guidelines for Consequence Analysis of Chemical Releases*, New York, ISBN 0-8169-0786-2.

AIChE, Center for Chemical Process Safety (2002), *Guidelines for Chemical Process Quantitative Risk Analysis*, (2nd Edition), New York, ISBN 0-8169-0720-X.

Arendt, J. S. and Lorenzo, D. K. (2000), *Evaluating Process Safety in the Chemical Industry*: A *User's Guide to Quantitative Risk Analysis*, AIChE, New York (a short overview for managers).

Greenberg, Harris R., and Cramer, Joseph J. (1991), *Risk Assessment and Risk Management for the Chemical Process Industry*, Van Nostrand Reinhold, New York, ISBN 0-442-23438-4.

IAEA (1996), *Manual for the Classification and Prioritization of Risks Due to Major Accidents in Process and Related Industries*, ISSN 1011-4289.

IAEA(1998), *Guidelines for Integrated Risk Assessment and Management in Large Industrial Areas*, ISSN 1011-4289.

OECD (1989), *Risk Assessment and Risk Management for Accidents Connected with Industrial Accidents*, Paris, OECD Environment Monograph No. 19.

Pitblado, Robin and Turney, Robin (1996), *Risk Assessment in the Process Industries* (2nd Edition), Institution of Chemical Engineers, Rugby, Warwickshire, UK ISBN 0 85295 323 2.

UNEP (1992), APELL *Technical Guide on Hazard Identification and Evaluation in a Local Community*, ISBN 92-807-1331-0.

US EPA (1999), *Risk Management Program Guidance for Offsite Consequence Analysis*, available at: www.epa.gov/ceppo/ap-ocgu.htm#112r.

US PIRG (1999), *At Risk and In the Dark: Will Companies In Our Communities Reduce Their Chemical Disaster Zones?*, available at: www.pirg.org/reports/enviro/in_the_dark/index.html.

Health Aspects

IPCS, OECD, UNEP IE, and WHO (joint publication) (1994), *Health Aspects of Chemical Accidents, Guidance on Chemical Accident Awareness, Preparedness and Response for Health Professionals and Emergency Responders*, OECD Environment Monograph No. 81, UNEP IE/PAC Technical Report No. 19, Paris.

IPCS (1999), *Public Health Role and Chemical Incidents: Guidance for National and Regional Policy Makers in the Public/Environmental Health Roles*.

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(These Workshops and Special Sessions, presented in chronological order, served as input for the Guiding Principles)

Workshop on Prevention of Accidents Involving Hazardous Substances: Good Management Practice (22-25 May 1989, Berlin), report published in 1990 as OECD Environment Monograph No. 28.

Workshop on the Provision of Information to the Public and on the Role of Workers in Accident Prevention and Response (11-14 September 1989, Stockholm), report published in 1990 as OECD Environment Monograph No. 29.

Workshop on the Role of Public Authorities in Preventing Major Accidents and in Major Accident Land-Use Planning (19-22 February 1990, London), report published in 1990 as OECD Environment Monograph No. 30.

Workshop on Emergency Preparedness and Response and on Research in Accident Prevention, Preparedness and Response (7-10 May 1990, Boston), report published in 1990 as OECD Environment Monograph No. 31.

Workshop on Prevention of Accidents Involving Hazardous Substances – The Role of the Human Factor in Plant Operations (22-26 April 1991, Tokyo), report published in 1991 as OECD Environment Monograph No. 44.

Workshop on Strategies for Transporting Dangerous Goods by Road: Safety and Environmental Protection (2 - 4 June 1992, Karlstad, Sweden), report published in 1993 as OECD Environment Monograph No. 66

Workshop on Chemical Safety in Port Areas (18–23 October 1993, Naantali, Finland), report published in 2001 as OECD Environment Monograph No. 93.

Special Session on Chemical Accident Prevention Preparedness and Response at Transport Interfaces (30 November-1 December 1993, Paris), report published in 1995 as OECD Environment Monograph No. 94.

Workshop on Small and Medium-Sized Enterprises in relation to Chemical Accident Prevention, Preparedness and Response (3 –6 May 1994, Toronto, Canada), report published in 1995 as OECD Environment Monograph No. 95.

Workshop to Promote Assistance for the Implementation of Chemical Accident Programmes ("International Assistance Activities related to Chemical Accident Prevention, Preparedness and Response") (6–7 February 1995, Divonne, France), report published in 1997 as EHS series on Chemical Accidents No. 3 (joint OECD/UNECE Workshop).

Workshop on Risk Assessment and Risk Communication in the Context of Chemical Accident Prevention, Preparedness and Response (11–14 July 1995, Paris), report published in 1997 as EHS series on Chemical Accidents No. 1.

Workshop on Pipelines (Prevention of, Preparedness for, and Response to Releases of Hazardous Substances) (3 – 6 June 1996, Oslo), report published in 1997 as EHS publications series on Chemical Accidents No. 2.

Workshop on Human Performance in Chemical Process Safety: Operating Safety in the Context of Chemical Accident Prevention, Preparedness and Response (24–27 June 1997, Munich), report published as EHS publications series on Chemical Accidents No. 4.

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CCPS/OECD *Conference and Workshop on Chemical Accident Investigations*, (2–6 October 2000, Orlando, Florida) report published on the OECD website in 2002.

Workshop on Integrated Management of Safety, Health, Environment and Quality, (26–29 June 2001, Seoul), report published in 2002 as EHS publications series on Chemical Accidents No.9.

Workshop on Audits and Inspections related to Chemical Accident Prevention, Preparedness and Response (6–9 March 2001, Madrid), report published in 2002 as EHS publications series on Chemical Accidents No. 8.

Special Session on Environmental Consequences of Chemical Accidents (28 November 2000, Paris), report published in 2002 as EHS publications series on Chemical Accidents No.7.

LEGAL INSTRUMENTS

CONVENTIONS

Chemical Accidents (general)

International Labour Organisation

Convention Concerning Safety in the Use of Chemicals at Work
Adopted: 25 June 1990, www.ilo.org/safework.

Convention Concerning the Prevention of Major Industrial Accidents
Adopted: 22 June 1993, www.ilo.org/safework.

UN *Economic Commission for Europe*

Convention on the Transboundary Effects of Industrial Accidents; Adopted: 17 March 1992, www.unece.org/env/teia/welcome/html.

Convention on the Protection and Use of Transboundary Watercourses and International Lakes; Adopted: 17 March 1992, www.unece.org/env/water and www.iwac-riza.org.

Information to the Public

UN *Economic Commission for Europe*

Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters; Adopted: 25 June 1998, www.unece.org/env/pp/.

Transport of Dangerous Goods

UN *Economic Commission for Europe*

European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR); Adopted: 30 September 1957 (amended 1985), www.unece.org/trans/danger/danger.htm.

European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN); Adopted: 25 May 2000, www.unece.org/trans/danger/danger.htm.

Regulations concerning the International Carriage of Dangerous Goods by Rail (RID), Annex I to Appendix B to the Convention concerning International Carriage by Rail (COTIF), www.unece.org/trade/cotif/Welcome.html.

International Maritime Organization

International Convention for the Prevention of Pollution from Ships, Modified by the Protocol of 1978 relating Thereto (MARPOL 73/78); Adopted: 2 November 1973 (Protocol: 17 February 1978), www.imo.org.

International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC); Adopted: 30 November 1990, www.imo.org.

OECD COUNCIL ACTS

The OECD Recommendation of the Council concerning Chemical Accident Prevention, Preparedness and Response (C(92)1/Final) (under revision).

Decision of the Council on the Exchange of Information concerning Accidents Capable of Causing Transfrontier Damage (C(88)84(Final)).

Decision-Recommendation of the Council 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)).

Recommendation of the Council on the Application of the Polluter-Pays Principle to Accidental Pollution (C(89)88(Final)).

EC DIRECTIVE

Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances. ("Seveso II Directive"), http://europa.eu.int/comm/environment/seveso/ and http://mahbsrv.jrc.it.

(Note: a proposal to modify this Directive is under consideration)

ANNEX V

BACKGROUND INFORMATION

These *Guiding Principles* have been prepared as part of the OECD Chemical Accidents Programme, under the auspices of the expert group established to manage the Programme, the Working Group on Chemical Accidents (WGCA).

This publication was produced within the framework of the Inter-Organisation Programme for the Sound Management of Chemicals (IOMC).

The OECD

The Organisation for Economic Co-operation and Development is an intergovernmental organisation in which representatives of 30 industrialised countries (from Europe, North America, and the Pacific) and the European Commission meet to co-ordinate and harmonise policies, discuss issues of mutual concern, and work together to respond to international concerns. Much of OECD's work is carried out by more than 200 specialised Committees and subsidiary groups made up of member country delegates. Observers from several countries with special status at the OECD, international organisations, and non-governmental organisations (including representatives from industry and labour) attend many of the OECD's workshops and other meetings. Committees and subsidiary groups are served by the OECD Secretariat, located in Paris, France, which is organised into Directorates and Divisions.

The Chemical Accidents Programme

The work of the OECD related to chemical accident prevention, preparedness and response is carried out by the Working Group on Chemical Accidents, with Secretariat support from the Environment, Health, and Safety Division of the Environment Directorate.[1] The general objectives of the Programme include: exchange of information and experience; analysis of specific issues of mutual concern in member countries; and development of guidance materials. As a contribution to these objectives, more than 15 workshops and special sessions have been held since 1989. For further information concerning the Programme, as well as a list of the guidance materials and other publications prepared as part of this Programme, see: www.oecd.org/env/accidents.

The work of the WGCA and, in particular, the development of the *Guiding Principles*, has been undertaken in close co-operation with other international organisations. A number of these organisations, including the International Labour Office (ILO), the International Maritime Organization (IMO), the United Nations Environment Programme (UNEP), the UN Economic Commission for Europe (UNECE), the World Health Organization (WHO), and the United Nations Office for the Coordination of Humanitarian Affairs (through the Joint UNEP/OCHA Environment Unit), are very active in the area of chemical accident prevention, preparedness and response and have prepared guidance materials on related subjects (see Annex IV for website addresses for these organisations).

Development of these Guiding Principles

This is the second edition of the *Guiding Principles*, updating and expanding the first edition published in 1992.

To help in the preparation of the second edition, the WGCA established a drafting group, with representatives of member and observer countries, industry, labour, non-governmental organisations and other international organisations. A list of participants in this group can be found on the Acknowledgements page.

The primary source of input for these *Guiding Principles* is a series of workshops and special sessions held from 1989 through 2001. These workshops and sessions were designed to address the wide range of issues associated with accident prevention, preparedness and response, and to consider the roles and responsibilities of the various parties who are necessarily involved in such activities, *i.e.*, government authorities at all levels, management of hazardous installations, other employees at the installation and their representatives, and the public (*e.g.*, communities located near hazardous installations). Each of the workshops benefited from the wide range of expertise and perspectives of about 100 participants, generally including representatives from all the interested parties. One objective of the workshops and special sessions was to reach a series of conclusions and recommendations related to "best practice." These have been adapted for use as primary input for the *Guiding Principles*.[2]

In preparing this document, the Drafting Group also took into account the work of the European Commission and many international organisations (such as ILO, IMO, OCHA, UNEP, UNECE and WHO). The materials prepared by these organisations provide important technical information that can support implementation of the general principles set out in this text. Many of these international guidance materials are included in the list of Selected References (see Annex IV).

To further test the validity and soundness of these *Guiding Principles*, the WGCA widely circulated the draft text, seeking input from a wide range of parties in both OECD and non-OECD countries, and in various concerned organisations. A special meeting of the WGCA and other interested parties was held in June 2002 to review and incorporate these comments, as appropriate. Further information about the participants in this process is included in the Acknowledgements page.

NOTES

1. The Environment, Health and Safety Division undertakes work in a range of subjects related to chemical safety, safety of biotechnology, and pesticides, and prepares publications in six areas in addition to Chemical Accidents. These are: Testing and Assessment; Good Laboratory Practice and Compliance Monitoring; Emission Scenario Documents; Pesticides; Risk Management; and Harmonisation of Regulatory Oversight in Biotechnology.

2. A complete list of the workshops and special sessions is included in Annex IV.

ANNEX VI

SUMMARY OF THE "GOLDEN RULES"

ROLE OF ALL STAKEHOLDERS

- Make chemical risk reduction and accident prevention, as well as effective emergency preparedness and response, priorities in order to protect health, the environment and property.
- Communicate and co-operate with other stakeholders on all aspects of accident prevention, preparedness and response.

ROLE OF INDUSTRY (including management and labour)

Management

- Know the hazards and risks at installations where there are hazardous substances.
- Promote a "safety culture" that is known and accepted throughout the enterprise.
- Establish safety management systems and monitor/review their implementation.
- Utilise "inherently safer technology" principles in designing and operating hazardous installations.
- Be especially diligent in managing change.
- Prepare for any accidents that might occur.
- Assist others to carry out their respective roles and responsibilities.
- Seek continuous improvement.

Labour

- Act in accordance with the enterprise's safety culture, safety procedures, and training.
- Make every effort to be informed, and to provide information and feedback to management.
- Be proactive in helping to inform and educate your community.

ROLE OF PUBLIC AUTHORITIES

- Seek to develop, enforce and continuously improve policies, regulations, and practices.
- Provide leadership to motivate all stakeholders to fulfil their roles and responsibilities.
- Monitor the industry to help ensure that risks are properly addressed.
- Help ensure that there is effective communication and co-operation among stakeholders.
- Promote inter-agency co-ordination.
- Know the risks within your sphere of responsibility, and plan appropriately.
- Mitigate the effects of accidents through appropriate response measures.
- Establish appropriate and coherent land-use planning policies and arrangements.

ROLE OF COMMUNITIES/PUBLIC

- Be aware of the risks in your community and know what to do in the event of an accident.
- Participate in decision-making relating to hazardous installations.
- Co-operate with local authorities, and industry, in emergency planning and response.

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