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**Report of CCPS/OECD Conference and Workshop on
Chemical Accident Investigations**

Orlando, Florida, United-States – 2, 5 and 6 October 2000

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**CCPS/OECD CONFERENCE AND WORKSHOP ON
CHEMICAL ACCIDENT INVESTIGATIONS
(Orlando, Florida, United-States – 2, 5 and 6 October 2000)**

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FOREWORD

This document presents the recommendations developed during the OECD sessions on “Chemical Accident Investigations” that were held on 2, 5 and 6 October 2000, in Orlando (US). These sessions took place in the framework of the “International Conference and Workshop on Process Industry Incidents” organised by the US Center for Chemical Process Safety (CCPS)¹ and co-sponsored, *inter alia*, by the OECD.

Thirty-two experts attended the OECD Sessions, representing eight Member countries, CCPS, industrial organisations, academia and other stakeholders (see List of Participants in Annex 1).

The OECD Sessions had the following objectives:

- identifying best practices in establishing and implementing accident investigation policies and programmes;
- developing input for the *revised Guiding Principles for Chemical Accident Prevention, Preparedness and Response*, which sets out guidance for public authorities, industry, labour and other stakeholders (scheduled to be published in 2002); and
- identifying further steps which would benefit from international co-operation and, in particular, for future OECD activities.

The OECD’s Working Group on Chemical Accidents recommended that this report be forwarded to the Joint Meeting of the Chemicals Committee and Working Party on Chemicals, Pesticides and Biotechnology, for consideration as an OECD publication. The Joint Meeting agreed that it should be made available to the public. It is published under the authority of the Secretary General of the OECD and posted on the OECD website.

¹ CCPS is a professional organisation affiliated with the American Institute of Chemical Engineers. Its work is focused on developing engineering and management practices to prevent or mitigate chemical accidents.

CCPS/OECD CONFERENCE AND WORKSHOP ON CHEMICAL ACCIDENT INVESTIGATIONS

Orlando, Florida, United-States – 2, 5 and 6 October 2000

Background on the Project on Accident Investigations at the OECD

1. In 1996, the US delegation to the Working Group on Chemical Accidents (WGCA) proposed that the WG undertake a project related to investigations of chemical accidents. The objective of this project would be to share experience and enhance understanding of the approaches used to identify the “root causes” of chemical accidents, to improve the ways investigations are carried out, and to facilitate the sharing of accident reports and lessons learned. The Working Group agreed that a project should be initiated as it could provide a valuable contribution to Member countries, and it accepted the US offer to lead this work.

2. In 1998, as a starting point for this project, the Working Group on Chemical Accidents conducted a survey to gain a greater understanding of the requirements and procedures in Member countries related to chemical accident investigations. Following a review of the survey results (available in document ENV/JM/ACC(98)4), the WGCA considered what further steps should be taken to facilitate the exchange of experience, and develop an understanding of best practices with respect to accident investigations.

3. At its 9th Meeting in October 1999, the Chemical Accidents Working Group considered what further steps should be taken as part of the project on accident investigations. It was informed that the Center for Chemical Process Safety (CCPS) was fortuitously organizing a Conference/Workshop focusing on investigations of chemical accidents to be held in October 2000 in Florida, co-sponsored by, *inter alia*, the US Environmental Protection Agency, the UK Health and Safety Executive and the Major Accident Hazards Bureau of the European Commission. The US delegation suggested that the OECD could also co-sponsor the activity and they offered to make the necessary arrangements. The WGCA agreed to this option, noting that by co-sponsoring the CCPS activity, the Working Group could use the venue as a means of moving forward with the project, build on the experience of the many experts expected to attend, and avoid duplication of effort.

The OECD Sessions during the CCPS Conference/Workshop

4. In order to meet the goals of the OECD project, the WGCA organised three sessions, held at the beginning and end of the CCPS Conference/Workshop. The objectives of these sessions were similar to those of the “regular” OECD workshops organised as part of the Chemical Accidents Programme, i.e.:

- to identify best practices in establishing and implementing accident investigation policies and programmes;
- to develop input for the *revised Guiding Principles for Chemical Accident Prevention, Preparedness and Response*, which sets out guidance for public authorities, industry, labour and other stakeholders (scheduled to be published in 2002); and

- to identify further steps which would benefit from international co-operation and, in particular, for future OECD activities.

General Recommendations from the OECD Sessions

5. The OECD session held after the third day of the Conference Workshop (5 October) provided an opportunity to review presentations from the Conference/Workshop and consider issues of concern. There was a lively discussion among the participants in this OECD session, including thirty-two people representing about eight countries, industry and labour (see the list of participants in Annex 3). Taking this discussion into account, the rapporteur (Lynn Provost from Canada), along with the Secretariat, prepared draft recommendations for review at the final OECD session held after the close of the Conference/Workshop on 6 October.

6. The recommendations cover the following topics related to investigations:

- A. Investigation of Accidents and Near-Misses: Role of Industry
- B. Investigation of Accidents and Near-Misses: Role of Public Authorities
- C. Key Elements of Root Cause Investigations
 - Collecting and Protecting Evidence
 - Investigation Team
 - Review of Investigations
 - Reports
 - Implementation of Recommendations
 - Maintaining the Quality of the Investigation Process
 - Constraints in Conducting Root Cause Investigations
- D. Sharing Results of Investigations
 - Investigations by Industry
 - Investigations by Public Authorities

7. Recommendations also address other topics related to chemical accidents that were discussed during the Conference/Workshop, although they are not directly associated with investigations (e.g. “Collection and Dissemination of Accident Reports” - see section E - and “Management of Change” - see section F). These are also important issues to take into account while revising the *OECD Guiding Principles*.

8. The recommendations were revised based on the comments made by participants during the final OECD session. The revised recommendations are presented in section “Workshop Recommendations” of this document.

Follow-up

9. At its 10th Meeting in November 2000, the Working Group on Chemical Accident reviewed the recommendations of the OECD Sessions and decided they should be published. The regular practice for workshops organised by the Working Group is prepare a publication, both in hard copy and on the Internet, containing the Conclusions and Recommendations along with the workshop Discussion Document. In this case, there was no Discussion Document, and the CCPS has published the presentations delivered during the Conference/Workshop². It was deemed that it may not be appropriate to prepare a formal, hard copy publication containing only the recommendations. Therefore, the Working Group agreed that the recommendations are made publicly available, and they are posted on the OECD website (with hard copies available on request).

10. With respect to follow up activities, the recommendations were presented to the Drafting Group for use in the revision of the *Guiding Principles*.

11. The Chemical Accident Working Group also considered the possibility to undertake further activities related to accident investigations.

² Center for Chemical Process Safety – International Conference and Workshop. Process Industry Incidents. Investigation Protocols. Case Histories. Lessons Learned. October 3–6 October 2000. Orlando, Florida, United-States.

Workshop Recommendations

Introduction

The objective in developing recommendations is to capture “best practices” concerning chemical accident investigations, as identified during the International Conference and Workshop on “Process Industry Incidents” organised by the CCPS (3 – 6 October 2000, Orlando, Florida)³. These recommendations were presented to the OECD Working Group on Chemical Accidents⁴, for use, as appropriate, in the revision of the *Guiding Principles on Chemical Accident Prevention, Preparedness and Response*.

Specifically, a review is underway to update, clarify and expand the *Guiding Principles* to take into account experience since they were first published in 1992. To put this in context, Annex 1 contains provisions of the existing *Guiding Principles* related to accident and near miss reporting and investigations.

The list of participants in the OECD sessions is included in Annex 2.

A. Investigation of Accidents and Near-Misses: Role of Industry

1. The local management of an installation should ensure that there is a prompt investigation and thorough analysis of all incidents⁵ involving hazardous substances.
2. Management of hazardous installations should adopt internal standards establishing clear guidance concerning the nature of the investigations that should be carried out, and the criteria to be used to determine the extent of investigations for different types of incidents. These standards could be based on commonly accepted guidance in this area, such as the guidance developed by the CCPS, or can be developed by the management to meet its specific situation.

³ The CCPS is the Center for Chemical Process Safety, a professional organisation associated with the American Institute of Chemical Engineers. The CCPS is primarily concerned with prevention and mitigation of chemical accidents.

⁴ The 10th meeting of the Chemical Accidents Working Group was 29 November – 1 December 2000.

⁵ This point is already in the *Guiding Principles*. The following definitions are included in the *Guiding Principles*:

“*Incidents*” are defined as “accidents and/or near-misses.”

“*Accident*” is defined as “any unplanned, sudden event which causes or is liable to cause injury to people or damage to buildings, plant, material or the environment.

“*Near-miss*” is defined as “any unplanned, sudden event which, but for the mitigation effects of safety systems or procedures, could have caused serious injury to people or serious damage to buildings, plant, material or the environment or could have involved a loss of containment possibly giving rise to significant adverse effects.”

3. For incidents (including accidents and near-misses), the level of the investigation should be commensurate with the extent to which lessons can be learned to improve safety over the short or longer term. In other words, those cases which have greatest potential for leading to improvements in chemical safety should be subject to the most intensive investigations involving a determination of underlying causes (sometimes referred to as “root causes”) as well as contributory causes, and should involve participation from a broad range of parties. Those cases with limited potential for learning lessons should be subject to more limited investigations.

- Some examples were identified where countries or organisations established a scale or matrix for measuring severity of accidents and near misses. Some of the advantages of using a severity scale or an event matrix are: to improve understanding of the nature and extent of problems; to prioritize actions and resources; to collect statistics which help measure progress; and to help meet goals and objectives. It was suggested that, to be effective, the selection criteria and methodology for using the scale or matrix should be kept simple.
- Management should be committed to doing root cause investigations for those incidents with the potential for learning lessons leading to improved safety. An appropriate level of resources should be provided for such efforts, and for taking the corrective actions recommended in the investigation report. Part of the follow-up should include the dissemination of information both within the company and, to the extent appropriate, to other companies and organisations. The dissemination of information should be done through established procedures, including a means for tracking information flows and follow-up.
- It was recognised that some countries require root cause investigations in cases where there are specified adverse effects to human health or the environment (e.g., off-site effects).

4. The importance of investigating near misses was emphasised. Near misses are often precursors to accidents, and can identify actions that can be taken to avoid accidents. In addition, near-miss programmes engage employees and help to distribute responsibility for safety. Currently, lessons that could be learned from near misses are underutilized.

- In order to improve understanding and learning from near misses, there first needs to be the identification by an employee that a near miss has occurred. This fact then needs to be disclosed/reported to appropriate parties. Following an appropriate review/investigation, information concerning the near miss and lessons learned should be disseminated within the company and, to the extent appropriate, to other companies and organisations. There should be follow-up to this information to help avoid the same, or similar, problems in the future.
- 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 of the importance of such disclosures. The procedure for disclosing/reporting should be relatively simple.

B. Investigation of Accidents and Near-Misses: Role of Public Authorities

5. Public authorities should investigate all major accidents⁶, as well as other accidents with the potential for providing insights for reducing the risks of significant accidents, in order to determine the underlying (or root) causes and contributory causes.

- Investigations should be documented, and the reports published, to inform other relevant parties of the lessons learned in order to improve safety of hazardous installations.
- Public authorities also have a responsibility to ensure that appropriate action is taken in light of the recommendations made.
- Investigations carried out by public authorities should be unbiased and be trustworthy, in order that the public can trust the outcomes.

6. Public authorities should establish the criteria by which it will determine priorities for investigations (i.e., which accidents should be investigated and to what extent), taking into account any resource constraints. The selection criteria should be chosen to maximize benefits, make most effective use of resources, and allow for timely action and results. In this regard, the public authority 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 involved, 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. The use of accident trend data, or epidemiological analyses, could help identify the areas where significant problems exist and therefore should be subject to investigation to determine causes.

- Resources should be provided to the public authorities to carry out their responsibilities with respect to accident investigation and dissemination of related information.

7. Where more than one agency (national, regional and/or local) is involved in investigations, efforts should be made to co-ordinate activities of these agencies. Such co-ordination will maximize the ability of witnesses to provide useful information, reduce disruptions in company operations, improve fairness, ensure consistency of evidence obtained from samples, and improve the effectiveness of the investigations. Agreements on co-ordination and collaboration need to be discussed, and agreed on, prior to the initiation of the investigation. The biggest stumbling block to effective co-ordination is differing agendas (e.g., some agencies focus on enforcement, others on determining causes in order to learn lessons for improving safety). Therefore, the objectives of the different agencies should be taken into account in developing the agreements on co-ordination.

- There were a number of options described for improving co-ordination including, for example, the establishment of a co-ordinating board, use of peer reviews, etc.

⁶ This point is already in the *Guiding Principles*, but may need to be revised in light of experience and the results of this Workshop. “Major Accident” is defined in the *Guiding Principles* as “any unplanned, sudden event which causes or is liable to cause serious injury to people or damage to buildings, plant, material or the environment.” It was suggested that this definition be reconsidered during the revision of the *Guiding Principles*.

C. Key Elements of Root Cause Investigations

8. While there is no clear agreement on the definition of “root cause”, there is a general understanding that root cause investigations should be taken at least to the point of determining the cause(s) that, if corrected, will prevent the recurrence of the events which lead to the same or a similar accident/near-miss. Some participants suggested that root cause investigations should be taken further.

9. It was suggested that necessary elements in root cause investigations should be to:

- (i) discover what happened;
- (ii) determine why the incident(s) happened;
- (iii) develop plans for corrective action in order to prevent a repeat of the incident(s); and
- (iv) implement the plans.

There should also be a critique of the investigation process, once it is complete, to help ensure that it has been effective and to learn for future investigations.

10. To be effective and credible, root cause investigations should be methodical, thorough, and fair. The purpose should not be to establish blame, but rather to understand what happened and why it happened, and to apply lessons learned to avoid similar accidents in the future. In this regard, management should try to maintain a culture that encourages openness and trust.

11. Protocols should be established for conducting 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. In this regard it should be clear that 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.

12. As part of the investigation, all possible accident scenarios should be identified based on available evidence and the team should consider all these scenarios and not prematurely lock into a particular one.

- Appropriate technologies and tools, such as modeling and metallurgical tests, should be used when appropriate in order to validate likely scenario(s).

13. The procedure for root cause investigations of accidents will usually consist of four main phases:

- i. Before there is access to the site: During the time when there is no access to the site where the accident occurred, a number of activities can be undertaken to further the investigation including: organising the investigation team; interviewing eyewitnesses (as soon as possible); 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 evidence⁷; undertaking investigations outside the restricted areas; preparing for large volumes of information; and taking aerial photographs.
- ii. During the initial site visit: During the initial access to the site, it is important to document the condition of the site, revise investigation plans, and identify time-sensitive evidence.

⁷ Evidence can be defined as “any items needed to evaluate scenarios and support analysis.”

- iii. During the ongoing investigation: During this phase, the focus will be on recovery of evidence, reconstruction, analysis, testing and simulation of scenarios, and systematically affirming or denying scenarios.
- iv. Preparing the investigation report and recommendations: Accident investigation reports should be available in a timely manner. When there is a long time lag in issuing reports, this reduces their value, causes delays in the application of improvements, and makes the implementation of recommendations more difficult. In many cases the company will have taken action prior to the issuance of the report (it was suggested that companies generally react within 120 days of an accident).

Collecting and Protecting Evidence

14. It is important to take account of the various types of information/evidence available to support investigations, i.e., testimony from humans (e.g., witnesses), documentation (from on or off-site, including, e.g., maintenance, laboratory, sampling and meteorological records), and physical evidence (e.g., from the accident scene and from related equipment).

15. To the extent possible, evidence should be protected in order to facilitate the investigation process.

- Emergency response teams should be trained to understand how to maximize evidence integrity.
- After an incident, 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.
- It was also suggested that in investigating accidents, all evidence should be gathered before the site is cleaned up. It was recognized, however, that this can create tensions, as the company is anxious to make repairs and restart operations.
- In cases of significant accidents, it is likely that there will be more than one investigation (e.g., by the company and by relevant authorities). Therefore, it is important for the different investigation teams to co-operate and share evidence.

Investigation Team

16. A team should be established for an investigation. The team should have a diverse membership including participants from different disciplines, with different skills, including members with knowledge of the specific facility subject to the investigation (e.g., individuals involved with operations and maintenance).

- Having a diverse team has a number of benefits including it: reduces the likelihood of bias, results in a more efficient use of resources, allows for differing views and different concerns

to be considered, improves credibility and appearance of competence, and generally results in better outcomes and a quicker completion of the investigation.

- All members of the investigation team should have the appropriate knowledge, competency and experience to carry out a scientific investigation and to fulfill their identified roles and responsibilities.
- There is more success in implementation of recommendations if the various interested parties are involved in their development.

17. 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.

Review of Investigations

18. It is valuable to use third parties, such as consultants, to evaluate the accident investigation findings and help ensure the quality of the investigation results and recommendations set out in the report.

Reports

19. The accident investigation reports 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 are not correct and why.

Implementation of Recommendations

20. The recommendations from investigations should be specific, in order to lead to corrections of technology or management systems. Generally, the investigation will lead to multiple recommendations for actions to be taken (no individual action will usually be sufficient).

- In developing recommendations, it should be recognised that the objective is to seek optimum, not perfect solutions.
- The recommendations will likely have application beyond the installation being investigated. Therefore, the management should ensure that the recommendations are circulated to other installations within the company and that all appropriate corrective measures are taken throughout the company. In addition, the recommendations should be made available to other companies that could benefit from the information in terms of improving safety (e.g., companies with installations similar to that where the incident occurred).

21. One concern identified is the fact that there is often a lack of adequate follow-through in the implementation of recommendations from investigations. In this regard, there is a need to verify that

corrective actions have been taken, that they were implemented as intended, and that they fixed the problems identified.

Maintaining the Quality of the Investigation Process

22. The methods used for investigations should be subject to review and scrutiny to be sure that they are leading to useful results. The protocol for investigations should be regularly reviewed, along with training materials and operating procedures. Consideration should be given as to whether the concept of underlying causes (or root causes) is understood and that the procedures in fact lead to the underlying causes.

- It can be very helpful to involve “outside” parties in the review process (including, for example, consultants or experts from industry associations).

Constraints in Conducting Root Cause Investigations

23. A number of constraints, or challenges, to conducting effective root cause investigations were identified. Some examples are outlined below.

- With respect to evidence, these challenges could involve, for example, the destruction or deterioration of evidence, 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 during which time there are a number of distractions.
- Other pitfalls involve limiting the possible scenarios and biasing the collection of evidence to match the chosen scenarios. In addition, there could be observer bias. These concerns support the idea that investigators need to be skilled, and need to be open-minded as to the possible causes of an accident.
- Laws designed to promote public access to information, as well as laws to protect confidential business information, can present hurdles to the collection and sharing of relevant evidence.
- There could be constraints due to limited financial or human resources available for the investigation, relative to the complexity of the investigation.
- Investigations can also be hindered if there is insufficient trust among parties involved, and if there are possibilities of liability issues.

24. Another problem identified in a number of investigations was that they were stopped prematurely. Efforts should be made to avoid this and to keep asking “why” until the underlying causes (or root causes) are identified. In this regard, it was noted that, 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).

D. Sharing Results of Investigations

25. There were several examples described in which major accidents were similar to earlier accidents or near misses and could, therefore, have been avoided if information concerning the earlier events had been shared and appropriate corrective actions taken. Such situations are not uncommon. This reinforces the need to improve sharing of lessons learned from accidents as widely as possible, and to ensure actions are taken when relevant experience is available.

- In this regard, efforts should be made to promote sharing lessons learned, for example, by using technology such as the Internet to facilitate communication as quickly as possible, by mitigating threats of enforcement actions or other legal liabilities, and by finding ways to protect confidential business information.

Investigations by Industry

26. Management should share lessons learned from internal investigations throughout the company (to management and workers and their representatives) and, in particular, to those in a position to implement the recommendations contained in the report. It is important that the lessons learned be provided to other installations within the company that might face similar situations. There should be a commitment throughout the company to take actions in light of the recommendations with respect to lessons learned.

27. 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 (e.g., due to retirements or downsizing).

- All new employees should receive training concerning accidents and near misses that have occurred related to their companies' activities.

28. The relevant information of investigation reports (lessons learned) should be shared with other companies 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 the lessons can be applied at all relevant facilities and by all personnel.

- In addition, management should share relevant aspects of the reports as widely as possible with other companies and, as appropriate, 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.
- The dissemination of information on lessons learned (including information related to near misses) should be done through an established procedure and there should be a means for tracking information flows and follow-up.
- Consideration should be given to using the Internet to facilitate communication among companies, and with other interested parties.
- Companies should seek to share key information about lessons learned through available national and international databases or clearinghouses.

29. It was recognised that small and medium-sized enterprises, as well as some other companies, do not have access to regular channels of information (through, for example, industry associations). Therefore, mechanisms should be developed to help ensure that such companies receive relevant information.

- Public authorities should facilitate the sharing of reports within industry. In this regard, public authorities should consider developing data bases related to incidents (accidents and near misses), in order that enterprises can easily get access to the information (e.g., by making the information available via the Internet).

30. It is incumbent on industry proactively to seek out, and utilize, relevant experience of other companies. For example, such experience may be available in accident reports on company websites, in national and international databases, and in other accessible sources of information.

Investigations by Public Authorities

31. Investigation reports prepared by public authorities should be made generally available, including to the public, with modifications necessary to protect confidential business information.

- It is incumbent on public authorities to disseminate such reports to the industrial organisations within their country that might benefit from the lessons learned from the investigation.

32. A mechanism should be developed to facilitate sharing of investigation reports in an international context and, in particular, to improve sharing of information about causes of accidents.

33. Efforts should be made to develop a basic agreed framework and a common language for use in preparing investigation reports in order to facilitate sharing of information related to investigations.

- Such a framework helps make the information contained in the reports accessible and understandable and, in this regard, should include a summary of the findings of the investigation.

34. A number of other parties should 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.

E. Collection and Dissemination of Accident Reports

Note: While the focus of the Conference/Workshop was on accident investigations and, in particular, root cause investigations, there were a number of presentations related to accident reporting schemes and databases. These reporting schemes and databases generally contain some information on the causes of accidents and lessons learned; they generally do not include reports of full root cause investigations.

35. Efforts should be made to improve access to databases containing accident reports, and to facilitate linkages between databases, in order to help disseminate lessons learned to those who could use them. In addition, efforts should be made to enhance the usefulness of such databases.

F. Management of Change

36. It is important to keep both safety-related technology and procedures up-to-date and consistent with each other, appropriately applied, and periodically checked.

37. Management should recognize that any changes in technology or changes in management and organisations (such as staffing changes) may affect safety. One example cited involved making “improvements” in technology to reduce chronic emissions; this inadvertently led to a chemical accident. Any such changes in technology or organisation should trigger reviews of procedures, maintenance plans, etc.

- It was suggested, for example, that it may be necessary to review, and question, the manufacturer’s maintenance recommendations in light of any changes in technology.

ANNEX 1

Provisions in the existing OECD Guiding Principles (1992) related to Accident and Near Miss Reporting and Investigation

E.5. Incident⁸ Reporting and Investigation: General Principles

E.5.1. Efficient reporting and investigation of all significant incidents should be undertaken by industry and public authorities, as they can provide an important contribution to the safe operation of hazardous installations. Incident reporting and investigation can also help to instill public confidence that proper actions will be taken to avoid similar incidents, or incidents with similar consequences, in the future.

- (i) Reporting and investigation should identify causes of incidents and lead to remedial action to correct any deficiencies in technology or procedures which led to the incident.
- (ii) All interested parties should encourage, and management should promote, the full reporting and critical examination of accidents and near-misses.

Reporting

E.5.2. All fatalities, regardless of cause, all significant incidents, and other "reportable" events as determined within the enterprise, should be immediately reported by local management to the appropriate members of management of the enterprise.

- Reportable events should include those which occur in conjunction with work by contractors.

E.5.3. Employees and contractors should be positively encouraged by their management to report all incidents to appropriate managers in the enterprise so that the causes can be established.

- (i) Employees should be given the appropriate training in hazard identification to facilitate this.
- (ii) Employees should also be encouraged to discuss near-misses among themselves immediately after they happen.
- (iii) Efforts should be made to foster an environment where reporting incidents and discussing them are considered to be positive activities.
- (iv) Employees should be given the assurance that there will be no adverse repercussions for reporting incidents to management or discussing incidents among themselves.

⁸ In the *Guiding Principles*, "incidents" are defined to be "accidents and/or near-misses."

E.5.4. Public authorities should require prompt notification to an appropriate authority of the key elements of major accidents involving hazardous substances. This notification should be followed up by formal written reports.

- (i) Public authorities should encourage the voluntary reporting by enterprises to public authorities of accidents and significant near-misses beyond that legally required.
- (ii) Similar information on incidents should be provided to relevant trade associations.

E.5.5 Mechanisms to foster the 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 the sharing of information within industry, means should be developed to involve public authorities in this information sharing without jeopardising the enterprises' interests.

E.5.6 Public authorities and industry should promote further efforts to improve the international exchange of information on significant accidents and near-misses in order to promote safety.

- Efforts should be made to co-ordinate reporting by industry at the national and international level, in order to facilitate information sharing.

E.5.7 Public authorities should also establish a structured national system for maintaining statistics on accidents involving hazardous substances. This will facilitate: exchange of information; analyses of this information; and dissemination of the results of the analyses.

Investigation

E.5.8 The local management of an installation should be responsible for ensuring the prompt investigation and thorough analysis of all incidents.

- (i) The emphasis should be on identifying the underlying causes, the lessons to be learned, and ways to prevent future accidents rather than identifying the person(s) responsible.
- (ii) The use of a computer database for storing the key elements of incidents can facilitate their analysis. By this means, 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 which have occurred.

E.5.9 Public authorities should independently investigate all major accidents.

- (i) Where appropriate, this investigation should be conducted by a group of experts (for example, a specially designated commission) which includes different individuals than those responsible for inspection of installations and enforcement of the control framework.
- (ii) All appropriate interested parties should have an opportunity to be involved in this investigation.

E.5.10 In all accident investigations, efforts should be made to determine the underlying cause(s) in a chain of events leading to an accident, and not to limit the investigation to determining the apparent cause(s).

- 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 boredom, stress, overwork, lack of training, inadequate procedures, poor ergonomic design, poor system/technology design, communication problems, management inadequacies, inappropriate safety goals, and similar factors.

E.5.11 Public authorities should publish accident investigation information for as wide dissemination as possible. This should include sufficient information to enable it to be useful in other situations, as well as any conclusions arising from the analysis of accident data.

- Public authorities are in a unique position to correlate information, foster exchange of information, and provide credible analyses. Such information is important in order to gain knowledge useful for public authorities and management in their role in evaluating and making decisions related to, for example, regulation, monitoring, preparation of emergency plans, and development of risk assessment and management techniques.

ANNEX 2

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