

the Seveso 2 directive and the oil industry

Prepared by the CONCAWE Safety Management Group's Special Task Force on the Seveso 2 Directive (S/STF-8)

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ABSTRACT

This report has been prepared in order to give guidance to the management of sites in the oil industry on the interpretation of the Seveso 2 (or COMAH) Directive. Emphasis has been put on differences with the Seveso 1 Directive. A number of items were selected and worked out in more detail, and in some cases completed with examples. This guidance is based on the provisions of the Directive itself. As the Directive is implemented in the member states (due in February 1999), more information will become available in the different member states from other kinds of industries, professional organisations, competent authorities, etc. which might also be helpful in the interpretation and final implementation of this Directive.

KEYWORDS

Seveso, COMAH, Directive, Oil Industry, Accidents, Safety, Hazards, Installation.

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SUMMARY

The subject of this report is the Council Directive on the Control of Major Accident Hazards involving dangerous substances, popularly known as the COMAH Directive, or alternatively, Seveso 2. This Directive applies to establishments which hold more than specified quantities of substances which are classified as hazardous because of their toxicity, flammability, or potential to cause harm to the environment. Many petroleum products are classified as hazardous and thus many oil industry sites will be "Seveso sites".

This report is intended to give guidance on which sites should be so classified and information on what the implications are. Practical guidance is given on how to develop a Major Accident Prevention Policy (MAPP) and the Safety Management System, and also on the content of the Safety Report.

1. INTRODUCTION

Council Directive 96/82/EC¹ on the Control of Major Accident Hazards involving dangerous substances (the Seveso 2 or COMAH Directive) replaces the earlier Seveso 1 Directive (82/501/EEC)² as amended. This report provides some general guidance on the interpretation of the requirements of the Seveso 2 Directive as they particularly apply to the oil industry across the European Union.

For new sites brought within the Directive for the first time, useful information on the regulations can be found on Web Sites:

<http://www.ess.co.at/hiterm/regulations/regulations.html>
<http://mtrls1.jrc.it/mahb/home.html>
<http://www.open.gov.uk/hse>

In particular, useful information on the directive and its implementation including copies of the Guidelines on various aspects of the directive can be found on the Web Site of the Major Accident Hazard Bureau:

<http://www.mahbsrv.jrc.it>

For sites which already fall within the existing Seveso 1 Directive, the major changes are as described below.

1.1. DIFFERENCES BETWEEN SEVESO 1 AND SEVESO 2

The objective of the Seveso 2 Directive is to achieve a more effective and consistent implementation of the earlier Directive, to improve information exchange and to achieve better risk and accident management. The key differences between Seveso 1 and 2 are listed below and explained more fully in following sections.

- Seveso 2 relates to establishments (i.e. whole sites), not installations.
- The concept has been introduced of adding inventories of substances with similar hazards and the category “Dangerous to the Environment” has been introduced.
- At the lower-tier threshold an operator must comply with the requirements of Article 6 (notification), and meet new requirements under Articles 7 (preparation of a Major Accident Prevention Policy) and 10 (updating of the MAPP following modifications).
- At the top-tier, operators must comply with Articles 6, 8, 9, 10, 11 and 13. These largely impose similar responsibilities as under the earlier Directive i.e. to prepare a safety report (Article 9), to have on-site emergency plans and to provide information to enable the preparation of an off-site emergency plan (Article 11) and to provide information to the public of actions to be taken in the event of a major accident (Article 13). However Article 8 is a new requirement for information exchange between operators where there is a potential “Domino” effect and Articles 9, 11 and 13 are more detailed and prescriptive in their requirements.
- The requirements for a safety report are now set out in greater detail in Annexes II and III of the Directive (Annex III focusing on safety management systems) and there is a greater emphasis on demonstration that sufficient and

reliable measures are in place to prevent and mitigate against major accidents.

- There are greater requirements for operators to provide information to and consult with the workforce and the public under Seveso 2. For example, workers must now be consulted in the preparation of on-site emergency plans (Article 11) and the safety report must be made available to the public (Article 13.4).
- Under Seveso 2 there is a duty to test emergency plans.
Seveso 2 also imposes additional requirements on the member states and Competent Authorities:
 - The conclusions of the review of the safety report by the Competent Authorities must now be communicated to the operator (Article 9.4).
 - There is a requirement for regular inspections by the Competent Authorities (Article 18).
 - The Competent Authorities have a duty to prohibit use where the measures taken by the operator for the prevention and mitigation of major accidents are “seriously deficient” (Article 17).
 - Member states must set up a system for land use planning around major hazard sites (Article 12).

Although there are fewer exemptions under Seveso 2, pipelines, transport and intermediate temporary storage are still specifically excluded (Article 4).

1.2. KEY ISSUES FOR THE OIL INDUSTRY

The key issues for operators which have been identified by S/STF-8 as requiring further guidance in response to the Directive are as follows:

- 1) Application of Directive (Annex I)
 - the classification of middle distillates (kerosine, diesel/gas oil) as dangerous to the environment (Part 2)
 - how are inventories added using the partial fractions rule?
- 2) Requirements for lower-tier operators
 - what does a MAPP comprise? (Article 7)
- 3) Requirements for top-tier operators
 - what is involved in preparing a safety report? (Article 9)
 - what constitutes a test of emergency plans? (Article 11)
 - how often should audits and reviews be undertaken and how extensive should they be? (Article 18)
 - what sort of accidents should be recorded and reported? (Article 14)
 - what is the best way of liaising with the workforce and the general public? (Articles 11 & 13)

In some cases, operators will also have to adjust to a new regulatory regime given that inspections by the Competent Authorities (Article 18) and land use planning (Article 12) will become compulsory in all member states.

2. APPLICATION

The directive is not of itself a legal requirement on sites but has to be incorporated into national law by the Member States of the EU. Regulations to bring the Directive into force should be implemented by the member states by 3 February 1999. This process could mean that there is some variation in how the directive is applied in the various Member States. In particular, Member States are free to adopt more stringent regulations if they wish to do so. For information on the situation in their own country, readers should consult their own national legislation.

2.1. SCOPE

The scope of the Directive can be found in Article 2. It applies to establishments where dangerous substances are present in quantities equal or in excess of threshold quantities stated in Annex I of the Directive. These quantities for the two tiers for substances relevant to the oil industry are given in **Appendix A, Table A2**.

The definitions in Article 3 together with the exclusions are of key importance as regards the understanding of the scope of the Directive and these aspects are discussed below. The Flowchart in **Appendix A** combined with the worked out example will help operators decide if the regulations apply to their activities.

It should be noted that at the time of publication there is uncertainty as to how middle distillates such as diesel, heating oil and kerosine are to be treated under the respective national regulations which implement the Directive. The wording in the English version of Annex I, Part 1 of the Directive refers to "Automotive petrol and other petroleum spirits" and this would normally exclude the middle distillates. The wording is similar in most other language versions. However, the translations into some language versions (e.g. the Dutch) use wording which includes middle distillates. It is understood that the translations will all have to be aligned to have the same meaning as the English version.

Under the provisions of the Dangerous Substances Directive (DSD), producers and importers of such substances have to classify their products for a range of hazards. In many cases, these classifications are listed in Annex I to the DSD. However, not all the hazardous properties of petroleum substances have been so listed. Additional hazards have been addressed in CONCAWE Report No. 98/54³ and the recommendations made therein constitute provisional classifications.

Report No. 98/54 recommends to CONCAWE Member Companies that the most appropriate environmental classification for kerosine and gas oil / diesel streams should be "dangerous for the environment (R51 : toxic to aquatic organisms and R53 : may cause long term adverse effects in the aquatic environment)" as a provisional classification. Even so, strictly speaking it has the effect that these materials are covered by Category 9 (ii) of Annex I, Part 2 of the Seveso 2 Directive and consequently implies much lower threshold quantities for middle distillates.

The situation is illogical in that it results in more severe threshold quantities for the middle distillates than for gasoline for which a similar aquatic toxicity classification is proposed but which has a higher flammability. It is hoped that this discrepancy can be resolved before the date when establishments have to submit safety reports (see **Section 2.4**). As the situation develops, CONCAWE will update this information on the following Web Site which readers should consult for the latest position:

2.2. DEFINITIONS

“Establishment” shall mean the whole area under the control of an operator where dangerous substances are present in one or more installations, including common or related infrastructures or activities.

Under the revised directive, “Establishment” is now to be the industrial unit which has to be considered in deciding whether a site is subject to control under the Seveso 2 Directive. It means any installation or collection of installations which are within an area of land under the control of the same person or body. There may be situations where a large industrial complex consists of several plants, under different ownership, which are difficult to distinguish geographically by, e.g., a dividing fence. Such plants may be even interconnected. The essential point in distinguishing one establishment from another is who exercises control. Responsibilities of different operators in these circumstances are likely to have been considered already in relation to Health, Safety & Environment (HSE) legislation and for business purposes. The situation where one site includes separate establishments is covered by the provisions of Article 8 on the Domino Effect (**Section 2.3**).

An operator has to consider all activities which might be relevant to major accidents within his establishment. Two or more areas under the control of the same person or body and separated only by road, railway or inland waterway should be treated as one whole area.

“Installation” shall mean a technical unit within an establishment in which dangerous substances are produced, used, handled or stored. It shall include all the equipment, structures, pipework, machinery, tools, private railway sidings, docks, unloading quays serving the installation, jetties, warehouses or similar structures, floating or otherwise, necessary for the operation of the installation.

This definition is broad. It includes items such as storage, on-site pipework and pumping stations for example and is not restricted to a processing or handling activity. Neither is it limited to buildings nor particular types of plants. It encompasses all the supporting infrastructures which are connected to the parts where the dangerous substances are primarily used, handled or stored.

2.3. EXCLUSIONS

In the listing of the Directive there are six exclusions, of which three are of particular interest for the oil industry :

- c) *the transport of dangerous substances and intermediate temporary storage by road, rail, inland waterways, sea or air, outside the establishments covered by this Directive, including loading and unloading and transport to and from another means of transport at docks, wharves or marshalling yards.*

This qualifies the definition of the presence of dangerous substances so that those in transport are not taken into account when determining whether the regulations apply to the premises. For example in a railcar filling operation, the material in the railcars would not count when determining the total inventory of that material on an establishment and whether or not lower or top-tier requirements apply. However, once it has been determined that lower or top-tier requirements apply, then any transport activities at the establishment must be taken into consideration by the operator if they can cause or exacerbate a major accident.

Intermediate temporary storage covers situations where dangerous substances in the transportation chain (from the point of origin to the point of destination) are held temporarily. Thus, temporary storage (in vehicles or other transport containers) at motorway service stations, lorry parks and railway marshalling yards are out of the scope. So too are docks, wharves and quays where there is a change in transport mode. Container handling terminals would therefore be outside the scope of regulations. However, premises such as these would be subject to the regulations if the threshold quantities of dangerous substances were there for purposes other than intermediate temporary storage. For instance, bulk LPG used as fuel inside the establishment would not be regarded as temporary storage and therefore has to be included.

Long-term commercial storage and warehouses are within the scope if they have, or anticipate having, threshold quantities of dangerous substances. Similarly fixed bulk storage of dangerous substances in tanks or vessels at docks, etc. would not be considered "intermediate temporary storage" and the regulations would apply.

d) the transport of dangerous substances in pipelines, including pumping stations, outside establishments covered by this Directive

Note that, as discussed above, pipelines and pumping stations within the establishment would be covered if they are under the control of the operator. The European Commission is currently conducting a study to establish whether there should be a separate legal instrument covering major accident hazards for pipelines.

e) the activities or the extractive industries, concerned with exploration for, and the exploitation of, minerals in mines and quarries or by means of boreholes

This excludes, for example, on-shore and off-shore oil and gas drilling and extraction facilities, as well as traditional mining industries. It does not exclude on-shore oil and gas reception facilities.

2.4. DOMINO EFFECTS

There is concern that an incident on one site may affect a neighbouring site and as far as major accidents are concerned, there may be little difference between two adjacent sites each holding less than the threshold quantities and one large site occupying the same area of land but holding above the threshold quantity. In the revised directive, there is a new article covering such situations (Article 8, Domino Effect). This article imposes a duty on the Competent Authority (not the operators) to identify such situations. They must then ensure that the operators exchange such information as is required to take account of the nature and extent of the overall hazard of a major accident in their Major Accident Prevention Policies, Safety Management Systems, Safety Reports and internal emergency plans. Also that provision is made for cooperation in informing the public and in supplying information to the competent authority for the preparation of external emergency plans.

Even where such a legal requirement is not imposed by the competent authority, CONCAWE would recommend close liaison with neighbouring sites in developing their major accident plans.

2.5. TIMING OF IMPLEMENTATION

The timing of implementation is set by the publication date of the Directive in the Official Journal.¹ The relevant dates are as follows:

Date of Entry into Force	3 February 1997
To be Transposed into National Law by Member States by	3 February 1999
Repeal of Directive 82/501/EEC (Seveso 1)	3 February 1999
Notification by Establishments to Competent Authorities	3 February 2000
Submission of Safety Report for Upper Tier Establishments:	
By Establishments Previously Covered by Seveso 1	3 February 2001
By Establishments NOT Previously Covered by Seveso 1	3 February 2002

It is understood that even where a Member State does not have its implementing regulations in force by 3 February 1999 the remaining implementation dates will still apply.

3. MAJOR ACCIDENT PREVENTION POLICY

There is a new requirement for there to be major accident prevention policy (Article 7). This only applies to lower-tier establishments. It requires that an operator must establish a document containing a written policy :

- setting out overall aims and principles with respect to the prevention and control of major accidents
- ensuring a high level of protection for man and the environment.

The document setting out the MAPP must be 'made available' for inspection but need not necessarily be sent to the Competent Authorities.

Evidence has to be given that the operator has properly implemented the policy. This can be proved by demonstrating that a Safety Management System (SMS) is in place. Issues which have to be addressed in the SMS are given in Annex III of the Directive :

- organisation and personnel
- identification and evaluation of major hazards
- operational control
- management of change
- planning for emergencies
- monitoring performance
- audit and review

Note that there is no formal requirement on lower-tier establishments to provide a detailed written description of the SMS.

Top-tier establishments do not necessarily have to produce a separate stand-alone MAPP document because they have to demonstrate in their safety report (Article 9) that a MAPP has been put into effect.

A MAPP may be created from an existing HSE policy and a SMS may be integrated within an overall management system. In that respect it is important to understand that the HSE management system - which the MAPP relates to - is an essential part of the overall management system within the establishment. It may be appropriate to have only one MAPP available on a corporate level rather than several site-specific MAPPs.

The different requirements can be summarised as follows :

Lower-tier establishment

Major Accident Prevention Policy

(Article 7 + Annex III)

Top-tier establishment

Safety Report which will include a MAPP, presentation & description of the establishment, risk analysis,

(Article 9 + Annex II/III)

In both cases these must be supported by a Safety Management System.

Further references and details to the SMS can also be found in **Section 4.1** of this Guidance.

The MAPP must:

- be proportionate in scope and structure to the scale of the hazards of the establishment; therefore it must be a short and simple document; it is clearly not a mini safety report;
- clearly explain what has to be achieved, how and when, without going into great detail; therefore it must not describe the safety management system but only indicate that there is a system in place;
- lay down the framework within which adequate identification, prevention & control and mitigation of major accident hazards is achieved;
- must be reviewed and, if necessary, revised in the event of certain modifications;
- be endorsed and signed by someone at a senior level in the organisation demonstrating a top-down commitment;
- be widely distributed to employees and others, such as contractors at the establishment; however, it is not necessary to submit a MAPP document to the Competent Authorities, unless the Competent Authorities request it. It will usually be requested before an inspection visit.

An example of how a MAPP might look is given in **Appendix B**.

4. SAFETY REPORTS

Safety reports are only required for top-tier establishments. Compared to the old Directive, the Seveso 2 Directive has more detailed and prescriptive requirements (Annexes II and III) for the safety report and also requires that it be made available to the public. The various elements which will now need to be included in a safety report are discussed below.

4.1. DESCRIPTION OF THE SAFETY MANAGEMENT SYSTEM (SMS)

A key feature of a safety report as required under Article 9 will be a description of the SMS.

As discussed in **Section 3**, most companies and sites will already have an existing HSE management system, often integrated with a quality management system.

All top-tier establishments should ensure that the following items are as a minimum included within the SMS and described in a written form in the safety report:

1. the MAPP (which should be in writing)
2. the management organisation (which should show the reporting structure and define responsibilities at all levels in the organisation)
3. identification of training needs and how these are implemented (competencies, resources, etc.)
4. procedures for systematic major hazard identification and risk assessment
5. procedures and instructions for safe operation and maintenance, including shut downs and turnarounds of units, and the use of contractors
6. procedures for management of change (operations, plant, equipment, personnel, feedstock, etc.)
7. planning for emergencies (identification of emergencies, plans, testing and reviewing - also in written form)
8. monitoring performance (methods of reporting, investigation of non-compliance and corrective actions taken, external reporting of major accidents and near-misses, etc.)
9. audits and reviews (frequency and types of audit, reporting, tracking of recommendations, etc.)

For lower-tier establishments the same principles must be included in the SMS but need only be described briefly in the MAPP (see **Section 3**).

4.2. IDENTIFICATION OF MAJOR ACCIDENTS

4.2.1. Selection of Major Accident Scenarios

Some establishments may comprise a single installation (such as a distribution depot) whereas others may be made up of many installations (for a refinery, example installations may be crude distillation, hydrocracking, tank farm, etc.). For each installation, a set of representative releases should be identified for each dangerous substance on the installation (not just those above the threshold quantities) which could give rise to a major accident.

One of the criteria for major accident reporting (Annex VI) refers to “a quantity of at least 5%” of the top-tier threshold. Annex I allows inventories of dangerous substances “less than 2% of the relevant qualifying quantity” to be ignored provided they cannot act as an initiator of a major accident elsewhere on site. These two factors lead us to suggest that dangerous substances in quantities below say 1% of the lower threshold can be ignored for the purposes of identifying major accident scenarios.

Firstly, the most hazardous release must be considered - this will depend on the substance, type of release and the size of the isolatable inventory. Secondly, less serious, but more likely events must also be addressed.

For each dangerous substance, the most hazardous release will generally be:

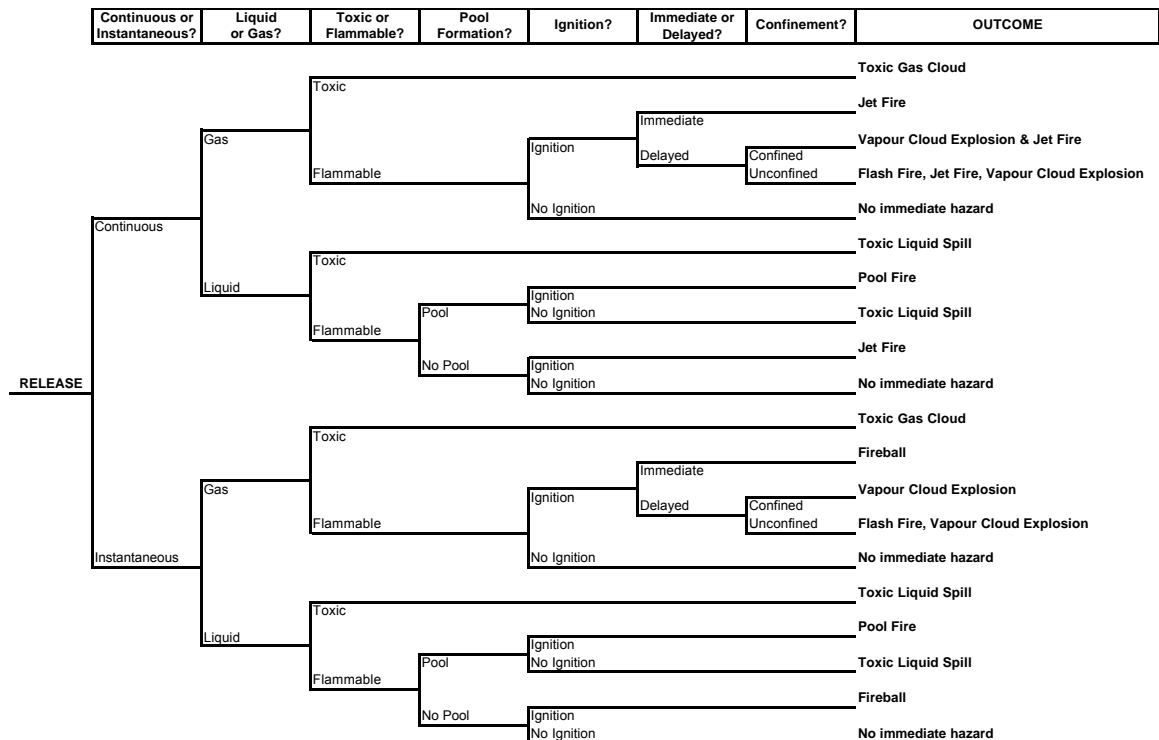
- vessel failures: consider the catastrophic failure of the vessel giving the largest release of the dangerous substance. However, where a substance is handled at elevated temperatures or pressures, the most hazardous release may be that which gives rise to the largest vapour cloud.

More likely failures will be:

- pipework and fitting failures: consider guillotine pipe failure, release from a 25mm diameter hole (representative of a more likely release from pipework and fittings) and release from a 13mm diameter hole (representative of serious leaks from flanges, pump seals and valve leaks, etc.). The releases should relate to a section of line which gives the most hazardous release (as described above).

Certain activities such as loading and unloading are more likely to cause loss of containment than generic equipment failures. In such cases failures affecting these systems should also be considered.

For each representative release there will be a range of possible outcomes. The event tree below illustrates the various possibilities:



Possible major accident scenarios which will usually be encountered in the oil industry are:

- for oil storage depots: storage tank fires, bund fires, running liquid fires (e.g. from spillages at loading racks, pumping stations, etc.), explosions inside tanks, oil spillages into the environment, etc.
- for LPG depots: jet fires, flash fires, BLEVEs, from releases associated with storage and loading operations; missiles from fires involving bottle stacks. Where there is sufficient confinement (e.g. inside a cylinder filling shed), explosions will also be possible.
- for refineries: all of the above plus fires and explosions on process units as well as toxic gas releases (e.g. HF, H₂S, NH₃, Cl₂).

4.2.2. Causes and Likelihood of Major Accidents

Appendix C provides a checklist for the causes of major accidents. Such events usually start with a loss of containment as a result of:

- 1) "generic" failures (e.g. corrosion, mechanical defects, seal failures, etc.) which might occur on any installation and where the frequency is unlikely to vary dramatically between units.
- 2) failures initiated by "site wide events", for example external and natural events (e.g. lightning strike, earthquake), whose frequency will depend on the siting of the installation as well as events such as loss of services, utilities, etc.
- 3) "operationally related" failures where the frequency will be installation specific and depend on the type and scale of operations carried out. The likelihood of such failures may be synthesised either by the adjustment of generic data or by

using fault and/or event trees. Examples of operationally related failures would be:

- loading/unloading operations (e.g. drive-aways, flexible hose failures, coupling failures, etc.)
 - extreme operating parameters (very high/low temperatures, high pressures, etc.)
 - potential for overpressure
 - overfilling of vessels
 - potential for internal explosion (e.g. operating within flammable range, runaway reactions, pyrophoric substances, incorrect mixing of reactants, etc.)
 - corrosion or erosion (e.g. handling substances which are highly corrosive to carbon steel, stress corrosion, abrasive fluids, etc.)
- 4) failures caused as a result of a smaller release escalating to a much larger release or failures as a result of knock-on from an incident on an adjacent plant. Blast overpressure, thermal radiation or missile impact may result in further releases. The likelihood of such incidents is often determined using event trees to model the incident progression.

4.3. PREVENTION AND MITIGATION OF MAJOR ACCIDENTS

The safety report should contain a description of the measures taken to prevent and mitigate the major accidents identified using the approach described above. A general checklist is given in **Appendix C**.

4.3.1. Prevention and Mitigation Measures at Design Stage

The safety report should discuss safety measures introduced at the design stage. This may cover such topics as:

- 1) justification of the selected processes. In the oil industry the processes are usually developed by licensors who will provide all the information necessary to ensure a safe operation, for example:
 - effects of process excursions, which alarms would sound and which emergency/safety devices should react
 - details of corrosion protection (material, additives, water injection, operating range, etc.)
 - need for redundant equipment to deal with an upset condition (e.g. double pumps on FCC tower bottoms)
 - safety devices performing a particular function (e.g. rotating equipment protection)
- 2) compliance with national/international codes (such as ISO, API, British Standard, CODAP, CODETI, etc.) such that best practice is shared across the industry (engineering and operating companies).
- 3) lessons learned as a result of experience from the licensees distributed via the licensor, by internal experience from incident reports and good practice exchanges. Also by external experience shared by professionals in groups like

CONCAWE and GESIP (a French organisation for safety in the oil and petrochemical industry).

- 4) lay-out of the process units and storage areas to avoid internal domino effects and to contribute to safety during maintenance works.
- 5) the ability of the utility networks (electricity, steam, water, air, etc.) to function as required in an upset/emergency situation.
- 6) the design basis for withstanding the effects of external events such as earthquakes, storms, flooding, subsidence, etc. This should also extend to the effects of lightning strikes affecting the power supplies and instrumentation.
- 7) functioning and reliability of instrument protection systems (e.g. degree of redundancy and diversity, fail safe valve positions, etc.).
- 8) protection of safety critical equipment and buildings against fire and blast damage (e.g. passive fire protection on emergency shutdown valves, blast proofing of control rooms, etc.).

A description and location of equipment to detect releases and limit the consequences of major accidents should be included in the report covering such aspects as:

- gas detectors
- cameras to supervise the units
- water pollution detectors
- water deluge systems and monitors
- kerbs, bunds and drainage to limit fire pool size
- safety relief valves and the flare network
- fire water network (water sources, grid pattern, fire and blast resistance, etc.)
- passive fire protection on structures, vessels and supports
- emergency depressurisation and dump systems

The report should describe the organisation set up to handle all safety aspects at the design stage (e.g. project technical reviews, HAZOP studies and other risk assessment methods). This aspect should also extend to modifications.

4.3.2. Prevention and Mitigation Measures during Operation and Maintenance

In relation to operations and maintenance, the report should contain the following kind of information :

- 1) relevant documentation describing the process and its controls e.g. process and instrument drawings, control loops, alarm and safety logic diagrams, etc.
- 2) any safety critical procedures during start-up, shutdown and normal operation of the unit
- 3) a description of procedures dealing with plant and utility upsets.

- 4) procedures for routine maintenance and planned shutdowns including shutting down of equipment and making it safe for work, permits to authorise the beginning of work (hot, electrical, excavation, etc.) and acceptance procedure after repair. The procedures should include working with contractors.
- 5) details of inspections, including statutory inspections, monitoring of vessels and pipework, testing of safety devices and alarm systems, etc.
- 6) the way in which information on the operating experience of the plant and near-miss incidents is fed back to improve the system.
- 7) a description of the operational aspects for mitigating incidents including:
 - means for raising the alert (local phones, radios, between fire trucks, phones between the site and the authorities, site and outside assistance)
 - means to supervise critical points (camera, explosimeters)
 - internal facilities to fight a fire with details on aspects such as water network and availability, fire water pumps with their characteristics, foam stocks (storage, quality), powder, mobile trucks and monitors and extinguishers
 - external agencies that may be called for assistance (private or civil forces), covering such aspects as means to fight a water pollution incident (booms, waste collection, etc.), treatment of casualties, etc.

The emergency plans will show the organisation in place to co-ordinate the actions necessary to mitigate the effects of a major accident (see **Section 5**).

5. EMERGENCY PLANS

The requirements in the Directive relating to emergency plans refer only to top-tier sites (but the MAPP required for lower-tier sites would include a section on planning for emergencies). Top-tier sites have to prepare an on-site emergency plan and they must now consult their workers in its preparation. They must also make information available to the Competent Authorities responsible for preparing the off-site plan. Both plans should be based on major accident scenarios which are possible at the establishment (see **Section 4.2.1**).

Under the revised directive, these two plans must now be tested:

- for the on-site emergency plan, preferably once a month with simple exercises, and preferably once a year with the Competent Authorities and associated emergency services; the Directive formally requires that emergency plans are reviewed, tested, and where necessary revised at least every three years
- for the off-site emergency plans, the testing will be the responsibility of those preparing the plan (charging arrangements may vary from country to country)

Preparation of off-site plans is the responsibility of the Competent Authorities and the only action on the operator is to make available information on the nature of possible major accidents along with their consequences and likelihood.

The remainder of this section relates to duties of the operator for preparation and testing of on-site plans only.

5.1. ON-SITE PLANS

The objective of on-site plans is to define all organisation measures, intervention methods and resources (internal and external) which the operator needs inside the installation to deal with accidents and so to protect people and environment.

On-site plans are based on accident scenarios which will feature in the safety report and may in turn be developed from hazard studies, risk analyses, etc. The on-site plan must now be drawn up in consultation with the workforce.

5.2. SITE INFORMATION

Information on the site will be described in the safety report. Relevant details will include:

- general maps
- access road maps
- meteorological conditions (compass card, rainfall data, etc.)
- geological conditions

5.3. ACCIDENT SCENARIOS

Each type of major accident (fire, explosion, toxic leak, toxic cloud, pollution, etc.) may be described on a specific “scenario sheet” which includes:

- release scenario (product, pressure, temperature, leak flow for the chosen scenario, etc.) including accident cases (e.g. refer to **Section 4.2.1**)
- environment (e.g. size of bund area, tank volume, tank height, height of retention wall, etc.)
- resources (e. g. water flow, foam agent flow, powder, CO₂, etc.) necessary to cope with the scenario
- description of equipment and logistics (fire fighting tenders with for each one: water, foam reserve and time span; fixed protection; water curtains; portable monitors, etc.) including if necessary external resources
- checklist of operations (from alarm to the end of operation including prevention of pollution with e.g. collection of fire water)

An example of a scenario sheet is given in **Appendix D**. Each scenario determines what needs to be done and the resources required, including manpower.

Where domino effects are possible between adjacent sites, these should be included in the list of accident scenarios.

It is important to recognise that the Directive also requires the impact of major accidents on the environment to be addressed in the emergency plans (including restoration of the environment) and also the environmental impact of the emergencies wastes themselves (e.g. dealing with fire water run-off).

5.4. RESOURCES AND EQUIPMENT

An inventory of resources and equipment to cope with major accident scenarios may be grouped on standardised sheets. Additionally, external resources (from the local fire brigade or mutual aid from other companies) can also be included on such sheets. Such sheets might cover for example:

- water availability
- foam agent reserves
- fire fighting tender description
- equipment for dealing with chemical spills
- means for rescuing people
- civil engineering, lifting, transport
- equipment for pollution protection

An example is given in **Appendix D**.

For external resources, company names, people to be called, relevant telephone numbers (for both normal working days and night / weekend) should be included in the corresponding sheets.

5.5. COMMUNICATION AND ORGANISATION

Alarm schemes should be described for each step of the response. These schemes include relevant telephone numbers, radio systems, sirens and those for internal and external calls. An example is given in **Appendix D**. At each stage, the number and position of available people (including on duty people) should be specified. All people (internal or external) who take part in the response, including those responsible for management and co-ordination should be included in the schemes (one for normal working days and one for nights and weekends). For all people involved in the emergency response, it is useful to prepare a sheet describing their specific actions (see **Appendix D**). The plan should consider the need to inform the public services and the Competent Authorities where appropriate.

5.6. EMERGENCY CONTROL CENTRE

Depending on the size of an industrial site (number of people, size of factory), a dedicated internal emergency control centre may need to be established in advance. In such cases, its location (including a need for a back-up), communications systems, organisation will need to be determined in advance.

5.7. EXTERNAL ASSISTANCE

Aspects which relate to outside assistance include amongst others:

- organisation of medical treatment (doctors, hospitals, ambulances, etc.)
- access policy on to site for external fire brigades and other personnel who can provide assistance (municipal, other companies, etc)
- logistics for which the police will take responsibility (access roads, roads to be blocked depending on accident and weather conditions)
- provision of emergency access when normal routes are blocked
- water authorities (who for example may need to close the water intakes or water supplies to the public)

5.8. TESTING OF EMERGENCY PLANS AND TRAINING OF PERSONNEL INVOLVED

Both the on-site and off-site plans must be tested at least every three years.

A training plan should be drawn up with the Competent Authorities and may involve external resources. Appropriate training should be provided, relevant to each category of person involved (plant simulators, fire school, rescue, environmental response, dealing with toxic spills, manning the emergency control centre, etc.). Included within the training plan should be a description of the frequency of training

and means of validating that all the people concerned have followed the right training at the right frequency.

5.9. DOCUMENT MANAGEMENT

Copies of the on-site emergency plan should be made available to:

- relevant external parties (e.g. fire brigade, police, etc.)
- internal people in charge of the on-site plan (as well as to the head office)
- external people or companies in specific cases
- emergency control centre

A list of people to whom the plan should be sent should also be included and acknowledgement of receipt should be requested. The plan should be a controlled document with appropriate procedures in place for updates and revisions.

6. PROVISION OF INFORMATION TO THE PUBLIC

The requirements for information to be given to the public have been increased in the revised directive. It now requires certain information to be actively communicated to individual members of the public (e.g. actions to be taken in case of a major accident) whilst other information need only be made generally available for public access (e.g. contents of a safety report).

Information which must be actively communicated to people living in the vicinity of a major hazard installation is only required for top-tier establishments covered by Article 9. Items to be communicated are given in Annex V of the Directive. This information must be reviewed at least every three years - or immediately following a modification to the MAPP or safety report - and re-issued to the public whenever it is revised or at least every five years.

The information should:

- be written in straightforward and simple terms avoiding the use of complicated technical expressions; it might be well possible that the information has also to be available in other languages in case of a multi-cultural community in the vicinity of the establishment;
- be understood by children as well as by adults; therefore illustrations might be useful as well as durable cards giving illustrated and summarised instructions;
- be adequate in the event of an accident but may also address delayed or indirect effects in the long-term on e.g. crop contamination, public health, etc.
- be available in a so-called Public Information Zone (PIZ) as determined by the Competent Authorities; costs involved in disseminating the information have a priori to be agreed between the Competent Authorities and the operator;
- be available in easily accessible locations like town halls, public libraries, etc.; in that respect operators and/or the Competent Authorities are encouraged to publicise its availability;
- mention that some aspects of the operator's activity are confidential - e.g. for commercial or security reasons - and can therefore not be communicated; for example sites may not want internal procedures for dealing with bomb threats to be in the public domain;
- preferably be written after consultation with the Competent Authorities in order to guarantee consistency in wording, approach with other establishments and eventually to allow the Competent Authorities to perform a co-ordinating role with respect to the Domino effect. The possibility of Domino effects raises the issue of who for example will pay for protective measures to be taken on an adjacent site and these issues need to be discussed in advance.

In **Appendix E**, an example is given of emergency instructions which might be made available to the public. Upon distribution, this information can be accompanied by a letter from, for example, the site manager.

Each member state will need to determine how any information (including that made generally available) is best communicated either directly by the operator or via the Competent Authorities.

7. AUDITS AND REVIEWS

This section relates to audits and reviews initiated internally. These are fundamental components of a Safety Management System which serve the purpose of allowing management to assure themselves that the system is being applied and of updating the system as necessary. Further information on Safety Management Systems can be found in a CONCAWE report on Managing Safety.⁴ Although normally carried out for management purposes, the requirement to have an audit and review programme is now specified in Annex III of the Directive. The inspections mentioned in Article 18 of the Directive are the responsibility of the Competent Authorities and not of the establishment itself.

7.1. AUDITING

Internal audits should be conducted to determine whether or not the SMS conforms to requirements (procedures, standards, legislation, etc.) and has been properly implemented and maintained. Audits provide information to management about the suitability and effectiveness of the SMS.

The following issues should be considered before commencing internal audits:

- types of audits to be conducted: what is the scope and objective?
- audit programme: how often should an audit be conducted? This should be appropriate to the nature and complexity of organisation (normally 1/year)
- auditors - resources, competence, objectivity
- procedures, standards, auditing aids like checklists
- format of audit reports and procedures for handling non-compliances
- management review of audit results

7.2. REVIEWS

Senior management should carry out a management review which should consider:

- the findings of audits (internal, corporate, external)
- the overall performance of the management systems
- changes in internal or external factors in the near future (legislation, permits, organisational structures, company policies and procedures, etc.)
- concern raised by other interested parties (neighbourhood, authorities, media, etc.)

8. REPORTING AND RECORDING OF MAJOR ACCIDENTS

Major accidents that cause, or may cause, serious danger for man, property or the environment must be investigated and the results of the analysis should be used to improve the design and the operation of the plants. One of the main changes between Seveso 1 and 2 is a more precise definition of which accidents should be reported.

8.1. SEVESO 1 / SEVESO 2 AMENDMENTS

The preface of both Directives states that the operator should inform the Competent Authorities, as soon as practical following a major accident, and provide the data available. Also member states should supply the Commission with data of major accidents, meeting the criteria which have occurred within their territory.

The main difference in the new directive is that the exchange of information should now also cover near-misses. (see **Section 8.3**)

In Articles 14-15 of Seveso 2 (and Articles 10-11 of Seveso 1), the operator shall be required to inform the Competent Authorities following a major accident and to provide them with the information and data available for assessing the effects of the accident, and member states shall inform the Commission. The difference is the inclusion in Annex VI of criteria for the notification of an accident.

Article 19 of Seveso 2 (and Article 12 of Seveso 1) require that member states and the Commission shall exchange information and the Commission shall set up a register and information system.

8.2. REPORTING MAJOR ACCIDENTS

Criteria for the notification of an accident as provided for in Annex VI are:

- quantity of dangerous substance involved
- consequences to persons, environment or property

8.2.1. Quantity of Dangerous Substances Criteria

This refers to any fire or explosion or accidental discharge of a dangerous substance involving a quantity of at least 5% of the qualifying quantity laid down in column 3 of Directive Annex I.

8.2.2. Consequences Criteria

This refers to any accident directly involving a dangerous substance and giving rise to one of the following events: harm to people, environment damage, property damage and cross-border damage.

8.3. NEAR-MISS REPORTING

Reporting and analysis of near-misses is a useful tool within the SMS for hazard identification and implementation of preventive actions to reduce the probabilities and limit the consequences of accidents.

The Seveso 2 Directive states that near-misses are covered in the system for the distribution of information concerning major accidents. This converts an internal tool into open information. In Annex III, (c), (vi) it is stated that procedures for monitoring performance should cover the operator's system for reporting near-misses, particularly those involving failure of protective measures. To avoid information about all near-misses (as opposed to those relating only to major accidents) entering the public domain, operators may wish to review their system to separate out near-misses relating to major accidents from the rest of non-compliances related to quality system or other management systems.

9. REFERENCES

1. EU (1997) Council Directive of 9 December 1996 on the control of major accident hazards involving dangerous substances (96/82/EC). Official Journal of the European Communities No. L10, 14.01.1997
2. EU (1982) Council Directive of 24 June 1982 on the major accident hazards of certain industrial activities (82/501/EEC). Official Journal of the European Communities No. L230, 05.08.1982
3. CONCAWE (1998) Classification and labelling of petroleum substances according to the EU dangerous substances directive (revision 1). Report No. 98/54. Brussels: CONCAWE
4. CONCAWE (1989) Managing safety. Report No. 4/89. Brussels: CONCAWE

USEFUL WEBSITES

<http://www.concaawe.be>

<http://www.mahbsrv.jrc.it>

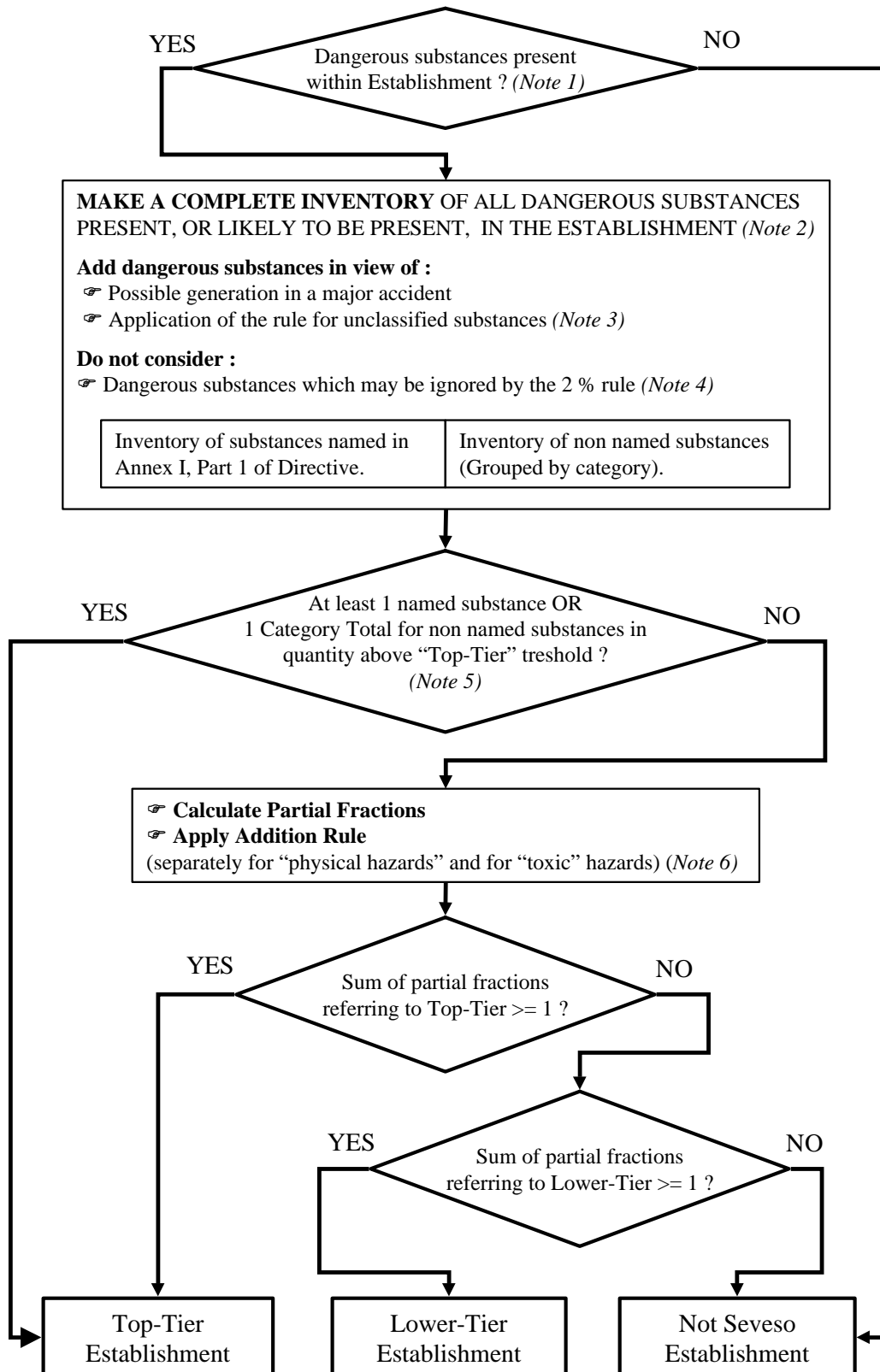
<http://www.eu.int/comm/dg11.cec.be>

<http://mtrls1.jrc.it/mahb/home.html>

<http://www.ess.co.at/hiterm/regulations/regulations.html>

<http://www.open.gov.uk/hse>

APPENDIX A APPLICATION OF THE DIRECTIVE



Terminology

- **Annex I, part 1** of the Directive ¹ is the table of named substances.
- **Annex I, part 2** is the table of categories of substances. Extracts of both of these tables are given in **Table A2** below for the substances and categories of substances most likely to be encountered on oil industry sites.
- **Top-tier threshold**: qualifying quantity stated in columns 3 of Annex I, parts 1 and 2.
- **Lower-tier threshold**: qualifying quantity stated in columns 2 of Annex I, parts 1 and 2.
- **Top-tier establishment**: establishment in which the quantity of dangerous substances present exceeds the top-tier threshold, and hence is subject to all articles of the Directive.
- **Lower-tier establishment**: establishment in which the quantity of dangerous substances present exceeds the lower-tier threshold, but not the top-tier. To these establishments, Articles 9, 11 and 13 do not apply.

Note 1 PRESENCE OF DANGEROUS SUBSTANCES

(Article 2, 1) : actual or anticipated presence, or presence of those which it is believed may be generated during loss of control of an industrial process, in quantities equal to or in excess of the thresholds in Parts 1 and 2 of Annex I.

Dangerous substance (Articles 3 – 4) :

Substance, mixture or preparation listed in Annex I, part 1 or fulfilling the criteria laid down in Annex I, part 2, and present as a raw material, product, by-product, residue or intermediate, including such substances for which it is reasonable to suppose that they may be generated in the event of an accident;

The definition is widely drawn to include the presence of a substance which are used or stored in an establishment. It therefore includes, for example, the storage of LPG for fuel use. However, asbestos sheeting and sprayed coatings which are sometimes present as construction materials and are classified toxic, are not covered.

Anticipated presence

Operators need to take account of the presence and anticipated presence of dangerous substances at their establishments in determining whether the regulations apply to their activities. Estimates of the maximum anticipated quantity present at any one time for each substance or preparation should, therefore, take account of inventory variations which may occur because of seasonal demand, fluctuations in business activity, etc.

An operator may choose to keep the total inventory of dangerous substances below the threshold quantities to avoid, or limit, application of the regulations but any future increase of inventories to, or above, the threshold levels would not be possible without complying with the regulations. In particular, a notification, and if applicable a safety report, would have to be submitted a reasonable period in advance of making those increases.

It may be appropriate for operators to relate “anticipated presence” to quantities of dangerous substances which they have consent to hold under existing Acts (e.g. UK Planning Act 1990).

Substances which may be present during the loss of control

Operators need to consider substances which may be generated during the loss of control of an industrial chemical process. The aim here is to extend application to those establishments which do not normally have specified dangerous substances present at, or above, threshold quantities, but which could generate them in quantities in excess of the thresholds during an accident.

Loss of control excludes expected/planned/permitted discharges and industrial chemical process prevents premises which do not involve chemical process being brought into scope solely because of dangerous substances generated during an accident e.g. fire in a warehouse.

Note 2 MAKE A COMPLETE INVENTORY

For the sole purpose to determine if the establishment is Seveso 2 classified or not, it is mostly not necessary to undertake a complete inventory, and shortcuts may be taken, e.g. as soon as one named substance or category of substances in Table 2 is found which exceeds the top-tier, the whole of the establishment is classified accordingly. If this is not the case, it becomes more complex as e.g. aggregation rules are applicable which require making a detailed inventory as shown.

A suggested model for an inventory database is given in the worked out example below.

Note 3 RULE FOR NON CLASSIFIED SUBSTANCES

Strictly speaking, to become classified as dangerous, a substance needs to fall within the scope of application of one of the 3 directives mentioned in the Seveso 2 Directive regarding the classification of dangerous substances. The Seveso 2 Directive enlarges the classification scope as also, for currently unclassified substances (e.g. a recycled stream within a plant), the provisional classification criteria shall be applied. CONCAWE's recommendations for the classification of petroleum substances are given in report 98/54.³

Note 4 2% Rule

Paragraph 4 of Annex I allows a quantity of a dangerous substance to be ignored if it is no larger than 2% of the relevant qualifying quantity and its location is such that it cannot initiate a major accident.

Note 5 CATEGORY TOTAL FOR NON NAMED SUBSTANCES

Under “Category total for non named substances” means the sum of the quantities of the non-named dangerous substances which fall into the same category, and hence have the same threshold.

Note 6 Under “Partial fraction” the ratio of the quantity to the relevant threshold is meant. Hence there are partial fractions referring to top-tier and to lower-tier.

Under “Apply addition rule” the aggregation of the partial fractions of both named and non named dangerous substances into one of two aggregates is meant, i.e.

- one relating to physical hazards (combination of categories 3, 4, 5, 6, 7a, 7b and 8)
- one to toxic hazards (combination of categories 1, 2 and 9)

Special attention needs to be given to dangerous substances which fall in more than one category.

The phrasing of the Directive under the notes in Annex I, Part 2 that “in case of substances and preparations with properties giving rise to more than one classification, the lowest thresholds shall apply”, is not easy to interpret and therefore could lead to different interpretations.

The phrase seems to stress that one should look for the worst case, at least if one looks at that substance alone. But, does this imply that the other hazard corresponding to the higher threshold limit may be completely ignored in the aggregation process ? What if the threshold levels corresponding to the flammable and toxic hazards are the same e.g. for a highly flammable and toxic product ?

Therefore, the simplest and most logical interpretation is to execute the two main aggregations taking into account both flammable and toxic hazard characteristics of one product. Mostly, it will turn out that the hazard characteristic corresponding to the lowest threshold will give the highest sum of partial fractions corresponding to the most severe case. This is however not always the case as it depends on the mix of substances present at the site. This is clearly illustrated in the worked out example below. If chlorine was not to be present on site and if one ignores the flammable character of “XYZ” by having the higher threshold of 5000 tons compared to 200 tons for the toxic one, this results in the establishment being no longer lower-tier.

Worked Example

In an establishment we find the following dangerous substances:

- 2 tonne propylene oxide [Extremely flammable (F+)– R12]
- 2 tonne hydrogen [Extremely flammable (F+) – R12]
- 5 tonne chlorine [Toxic (T)]
- 95 tonne methanol [Highly flammable (F) – R11, Toxic (T)]
- 10 tonne sodium fluoride [Toxic (T)]
- 120 tonne “XYZ” [Highly flammable (F) – R11, very toxic for aquatic organisms – R50/R53, irritating – R41].

These quantities and properties have been entered into the calculation **Table A-1** below:

Table A1 Worked Example

Name	Quantity (tonnes)	For non-named multiple hazard substances only	Named Substance	Properties		Qualifying Limits		Calculation of Contributing Fractions			
				Cat 1,2,9	Cat 3,4,5,6,7,8	Lower-Tier	Top-Tier	Lower Tier		Top Tier	
								Cat 1,2,9	Cat 3,4,5,6,7,8	Cat 1,2,9	Cat 3,4,5,6,7,8
Propyleneoxide	2		x		F+	5	50		2/5		2/50
Hydrogen	2		x		F+	5	50		2/5		2/50
Chlorine	5		x	T		10	25	5/10		5/25	
Methanol	95		x	T	F	500	5000	95/500	95/5000	95/5000	95/5000
Sodium Fluoride	10			T		50	200	10/50		10/200	
"XYZ" <i>(See footnote)</i>	120	As toxic As flammable		R50-53	F	200 5000	500 50000	120/200		120/500	
Sum of Partial Fractions - >								1.49	1.014	0.509	0.1014

Conclusion :

The establishment has to be classified as a lower-tier one.

Footnote :

Note the difference in treatment for substances presenting both physical and toxic hazards categories according to whether they are named or not.

For methanol there is only one row (corresponding with 2 partial fractions) while for "XYZ" (non-named substance) there are two lines : one corresponding to its physical (flammable) and one to its toxic characteristic.

Note also that the above example is not meant to be representative of an establishment in the oil industry such as a refinery as most of these usually qualify on the basis of a single category of substances. However, the example aims to show:

- how quickly a smaller establishment (pilot plant, terminal, warehouse), in which relative small quantities of (very) toxic chemicals are stored/handled, becomes classified under the application of the addition rule and
- the difficulties in applying the addition rule when aggregating a non named product which has both toxic and physical hazards (oxidising, explosive, flammable).

Table A2 Extracts from Table of Threshold Quantities in Annex I of the Directive.

PART 1 Named substances		
Column 1	Column 2	Column 3
Dangerous substances	Qualifying quantity (tonnes)	
	Lower-tier	Top-tier
Lead alkyls	5	50
LPG and natural gas	50	200
Acetylene	5	50
Methanol	500	5 000
Oxygen	200	2 000
Automotive petrol and other petroleum spirits	5 000	50 000
PART 2 Categories of substances and preparations not specifically named in Part 1		
Very Toxic	5	20
Toxic	50	200
Flammable (Flash Point between 21 and 55°C) R10	5 000	50 000
Highly Flammable (Flash Point < 21°C, not extremely flammable) R11	5 000	50 000
Extremely Flammable (Flash Point < 0°C, ibp <35°C) R12	10	50
Dangerous for the Environment:		
• R50: Very toxic to aquatic organisms	200	500
• R51/R53: Toxic to aquatic organisms and may cause long term adverse effects in the aquatic environment	500	2000

Note: The above table is intended as a guide and is not a complete list nor does it include all the explanatory notes in the Directive ¹ which should be referred to. Three important points to be noted are:

- Part 1 takes precedence over Part 2. For example, gasoline is named in Part 1, therefore it is the quantities in that part which apply, even though it is classified as Extremely Flammable and Dangerous to the Environment (R51/R53) both of which have lower qualifying quantities.
- Mixtures and Preparations are to be handled in the same way as pure substances.
- Kerosines, and gas oils /diesel fuel are currently recommended by CONCAWE ³ to be classified as R51/R53. However, these are provisional classifications which may possibly be changed.

APPENDIX B MAJOR ACCIDENT PREVENTION POLICY

The following example shows how a MAPP might look. The main emphasis has been put on defining responsibilities : i.e. who is responsible for what ? how can it be realised ?

<p>Major Accident Prevention Policy</p> <p>As a company, we are committed to :</p> <ol style="list-style-type: none">1. aim at preventing accidents which could cause harm to people and the environment2. ensure compliance with the law and with higher standards to which we voluntary subscribe3. evaluate and report our accidents and near misses4. be pro-active in promoting best practices5. manage HSE as a critical business activity by including it in staff appraisal6. encourage people to share this commitment and to engage and listen to the concerns of people. <p>In order to realise this policy :</p> <ol style="list-style-type: none">1. We will put in place systems and processes to manage the integrity of our activities. Our managers will personally take the lead by establishing clear targets. We will carefully select, train, and regularly assess the competence of our own personnel to sustain operations. We will also assess the capability of those who work on our behalf such as contractors, suppliers, partners and other third parties.2. We will regularly identify the hazards associated with our operations. We will take appropriate action to prevent or reduce the impact of potential incidents or accidents by using sound standards, formalised procedures being covered by an adequate management system. We will maintain up-to-date information.3. We will operate within clearly defined parameters. We will properly manage risks associated with non-routine operations. We will also regularly evaluate and manage changes to processes, equipment, organisations and people to ensure that risks remain at an acceptable level.4. We will report and investigate incidents and near-misses and follow-up as necessary to improve our performance. We will share and learn lessons from such incidents and use the information to take corrective action and prevent recurrence. We will regularly measure our performance and set targets for continuous improvement. We will have emergency plans in place together with appropriate equipment, facilities and trained personnel to protect the public, the environment and those working for us in the event of an accident or an incident.
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APPENDIX C CHECKLISTS ON CAUSES, PREVENTION AND MITIGATION OF MAJOR ACCIDENTS

1. Possible Causes of Major Accidents:

1.1 Generic failures:

Mechanical failure within design parameters:

- structural failure due to shortcomings in design or fabrication
- joint or seal failure

Failure outside design parameters:

- inadequate pressure relief
- design temperature exceeded
- low temperature failure
- corrosion - internal and external
- fatigue failure

Human Error

1.2 Site wide events:

- impact damage by vehicle, train, ship (docks)
- aircraft and helicopter accidents
- flood
- subsidence
- earthquake
- explosion overpressure and missiles from events on-site and from adjacent sites
- low/high environmental temperature
- wind/waves
- lightning strike
- ice and snow loading
- loss of services/utilities
- sabotage

1.3 Operationally related failures:

- internal explosion
- exothermic reaction
- spontaneous decomposition
- spontaneous polymerisation
- reaction due to contamination or incorrect mixing of reactants

1.4 Escalation and failures caused by another result of the incident

- failure due to pool or jet fire engulfment
- failure due to missile impact
- failure due to overpressure

2. Prevention, control and minimising consequences

2.1 Site Wide Measures

- site-wide management systems - e.g. permit to work systems
- site fire precautions, fire certificate, fire mains, foam stocks, equipment, manning of fire stations, etc.
- special features of utilities and services to ensure integrity of supply, safe shutdown in the event of loss, etc.
- site communications in the event of an emergency
- medical services
- use of fire service during hot work as standby precaution
- site-wide fire and gas detection system
- water/steam curtains to prevent spread or dispersion
- passive protection - control room location/protection, window protection, thermal insulation
- alarm/warning systems
- site-wide shutdown systems
- emergency lighting systems/generator
- engineering features - flare mains, nitrogen systems, blow-down system, flares, drainage, etc.
- security arrangements e.g. perimeter fencing, control of access for personnel and vehicles

2.2 Measures specific to a particular installation or to a particular hazard

- plant specific management systems e.g. operating and emergency procedures
- protective systems
- shutdown systems
- relief systems
- fire and gas protection
- dump systems
- water sprays/deluge
- passive fire protection
- blast proofing
- separation distances

APPENDIX D EXAMPLE CARDS FOR ON-SITE EMERGENCY PLANS

SCENARIO SHEET

Scenario Sheets	<u>BUTANE LEAK ON P26 BULLET</u>			6.1.1
Edition : September 1998	Revision : 0	by : CONCAWE	Date : 01/09/98	page : 1/2

A - RISK EVALUATION

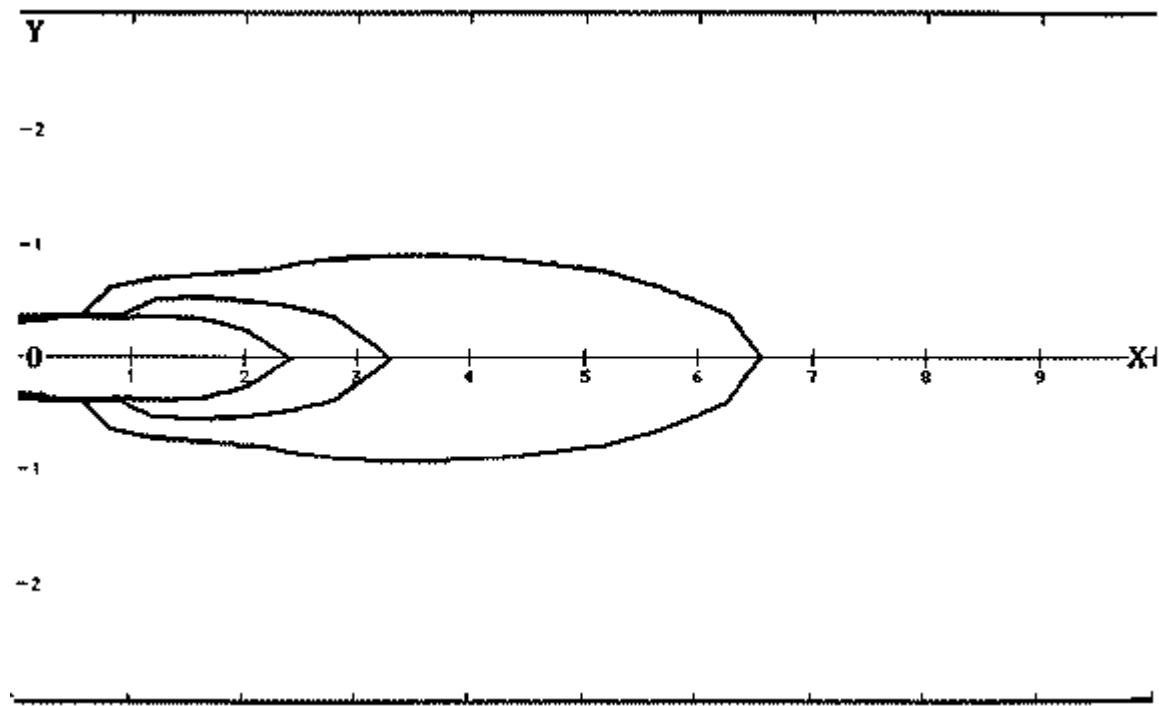
Product Liquefied Petroleum Gas (LPG) from which a potential burning gas cloud may occur and cause an explosion and a « flare type » fire.

Environment See here after the evolution of the gas cloud

- Data :
- pressure in the bullet : 3 bar
 - leak section : 3 cm² (seal rupture)
2.85 cm² (3/4" drain line rupture)

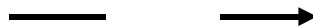
Butane : 0.20 kg/s

ISO values : 38036 - 120052 - 202067 (mg/m³)



Elevation = 5 m

Wind
(3 m/s)



Scenario Sheets	<u>BUTANE LEAK ON P26 BULLET</u>			6.1.1
Edition : September 1998	Revision : 0	by : CONCAWE	Date : 01/09/98	page : 2/2

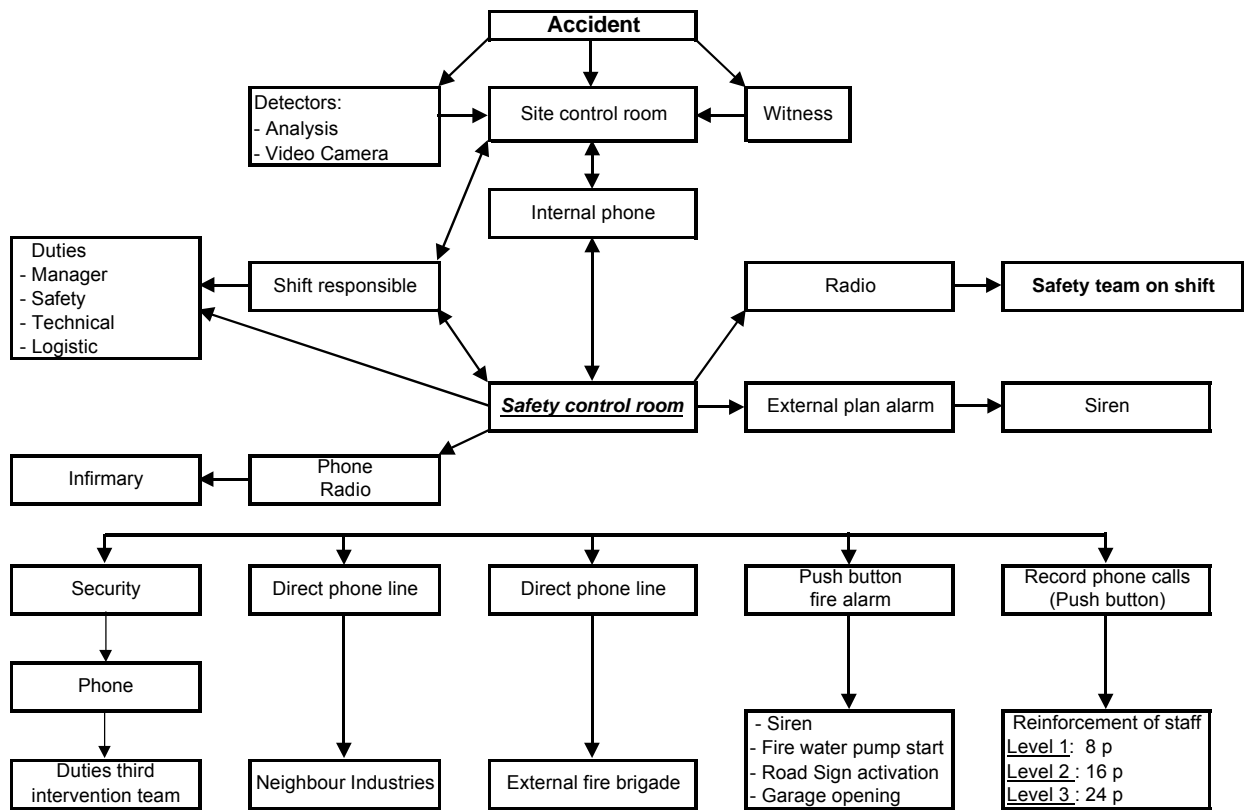
B - OPERATION CHECK-LIST

- Start the internal plan at the moment the alarm transmission is given by :
 - one hydrocarbon detection alarm by one or more gas detectors on the LPG storage area
 - the observation of the leak by an operator
- Activate the LPG storage water curtains from the control room
- Isolate by closing all valves and safety check valves « Whessoe » (emergency push button)
- Get closer depending on wind direction and control the explosiveness
- Determine a safety perimeter and ensure that all works are stopped and then mark out the area of concern
- Forbid all traffic and install control signs
- Wear breathing apparatus and check the area with operation's staff
- Adapt the water protection to the cloud by strengthening with water lances taking into account other bullets
- Prepare the connection of the fire water injection point in the bottom of the bullet at the line provided
- Inject fire water into the bullet until the water comes through the leaking equipment
- Keep a minimum water level in the bottom of the bullet (see the level gauge)
- Seal the leak in order to allow the emptying of the bullet in safe condition for replacement of the flange seal, drain line

ALARM SCHEME SHEET

General Data Sheets	<u>CALL FOR HELP</u>			2.1
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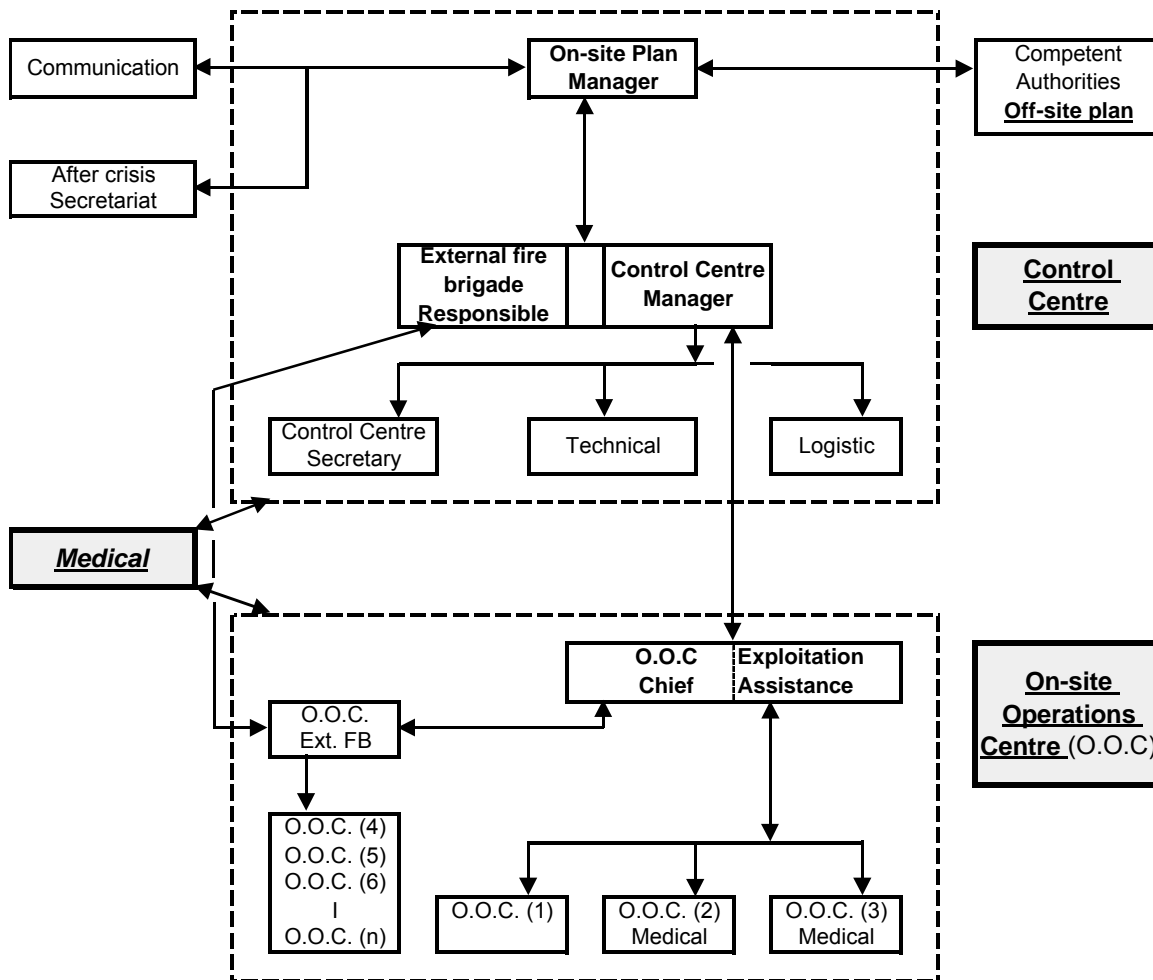
ALARM MANAGEMENT



In case of a major incident the alarm is given simultaneously in all groups

MISSION SHEET

Mission Sheets	<u>MEDICAL</u>			3.11
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During normal working day hours, the medical assistance will be ensured by

- Doctor
- Nurse

Outside normal working day hours, medical function will be assumed by the O.O.C. 2

The O.O.C. 3 will be used as reinforcement in case of necessity.

Mission Sheets	MEDICAL			3.11
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**In co-ordination with specialised assistance
Fire Brigade, Hospital, Police**

MISSIONS

- **TAKING CHARGE OF THE VICTIMS**
 - Give urgent medical care
 - Clear the victims to the sorting centre
 - Ensure the sorting of the victims
 - Take victims to the specialised centres

- **TELL LOGISTIC NEEDS TO THE CONTROL CENTRE**

- **ANSWER TO REQUESTS OF THE CONTROL CENTRE AND ON-SITE OPERATING CENTRE EACH TIME IT IS NECESSARY (New Victim)**

- **INFORM THE CONTROL CENTRE ABOUT THE NUMBER AND STATUS OF THE VICTIMS**

APPENDIX E EXAMPLE OF INFORMATION TO THE PUBLIC ON WHAT TO DO IN AN EMERGENCY

The following instructions are preferably printed on a laminated, coloured card so that it can easily be recognised. Illustrations might be very helpful. It should be kept in an accessible place and passed onto subsequent occupiers.

Emergency Instructions.

This card is produced to advise you what to do in the unlikely event of a major accident which could affect the public. Please read this card carefully and follow the instructions given in case of an alarm. This alarm will only be used in the event of a major accident. It will be a two tone sound operating continuously for 5 minutes ON, one minute OFF. This cycle will be repeated for as long as it is considered necessary. The All Clear warning will be a single tone and will last for 5 minutes.

Householders should ensure all occupants understand the instructions. Responsible persons in business/community premises should also be familiar with the action required so that they may instruct occupants in the event of an accident.

The alarm will be tested twice per year; at 7:00 PM on the first Wednesday in June and 2:30 PM on the first Wednesday in December.

If you hear the alarm warning:

1. Go immediately into a house or building.
2. Close external doors, turn off ventilation systems.
3. Do not collect children from school. They will be properly cared for.
4. Close windows. Pull curtains across windows facing industrial area.
5. Stay in room away from industrial area.
6. Do not light matches or other naked flames.
7. Turn the radio and/or television on ...
8. Do not use the telephone until the All Clear is given to ensure lines are free for emergency services.
9. Please co-operate fully with the instructions given by the emergency services.
10. Remain indoors until you hear the All Clear or until you receive instructions from the emergency services; doors and windows should then be opened to restore ventilation.

APPENDIX F EXAMPLES OF REPORTING AND RECORDING OF MAJOR ACCIDENTS

The following examples are given in order to provide further guidance and assistance on the interpretation of the criteria.

DANGEROUS SUBSTANCE	QUANTITY INVOLVED (Tons)
Hydrogen	2.5
LPG and natural gas	10
Methanol	250
Automotive petrol and other petroleum spirits	2500
Flammable (21 °C < FP < 55 °C, R10)	2500
Highly Flammable (R17 or FP < 55 °C under pressure)	10
Highly Flammable liquids (FP < 21 °C and not R11)	2500
Extremely Flammable liquids (FP<0 °C and BP<35 °C or T>BP)	2.5
Dangerous for the Environment (R50)	25
Dangerous for the Environment (R51 or R53)	100

Personal Injury / Death

PERSONS	QUANTITY
Death	1
Injured inside for at least 24 h	6
Injured outside for at least 24 h	1
Evacuation of confinement of persons for more than 2 hours	500 persons x hours
Dwelling outside the establishment	
Interruption of drinking water, electricity, gas or telephone services more than 2 hours	1000 persons x hours

Note: Consequence criteria

These only apply when the accident directly involves a dangerous substance and gives rise to one of the above events. For example, a death to a road accident on a Major Accident site would not be reported as a major accident.

Environmental damage

Terrestrial habitats : permanent or long term of 0,5 ha of protected habitat or 10 ha.

Marine habitats: significant or long term of 10 km river, or 1 ha lake, or 2 ha open sea. In assessing damage, reference could be made to several Directives (see table below).

Directive	Parameter	Limit
76/160	pH	6 – 9
75/440	Hydrocarbons	1mg/l
79/923	Hydrocarbons	Visible film
78/659	Hydrocarbons	Visible film

Property damage

Where	QUANTITY
Inside establishment	2 million ECU
Outside establishment	0,5 million ECU

Cross-border damage

Any accident giving rise effects outside national territory.