

## emergency planning

## guidance notes

### - refinery emergency planning

Prepared on behalf of the CONCAWE Major Hazards Management Group by the Special Task Force on Emergency Planning (MH/STF-1)

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ABSTRACT

This is the sixth Guidance Note in the series being issued by CONCAWE on the general subject of major hazards with specific reference to implementation requirements of the Seveso Directive. The overall purpose of these Notes is to provide guidance to CONCAWE contributing companies on various aspects of the assessment and control of major hazards. The Notes may also assist National Regulatory Authorities in their contacts with the Petroleum Industry.

This Guidance Note "Refinery Emergency Planning" describes emergency organization specifically for oil refineries. The general principles also apply to smaller oil installations such as marketing terminals.

A framework for emergency organization is outlined including descriptions of key responsibilities, and some typical actions are highlighted for various emergency cases. The need for training in emergency roles is emphasized and rehearsals of credible event exercises are recommended to ensure readiness.

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CONCAWE MAJOR HAZARDS MANAGEMENT GROUP EMERGENCY PLANNING GUIDANCE  
NOTE

REFINERY EMERGENCY PLANNING

1. INTRODUCTION

Safe design and operation of installations are basic obligations. Management and staff have legal and moral obligations to protect human life and health, and the environment.

The oil industry processes, stores and distributes large quantities of flammable materials, including gasoline which is classified as highly flammable, and liquefied petroleum gases. Refineries and major storage depots are therefore classified as hazardous installations within the provisions of the EEC Seveso Directive and similar national legislation.

The emergency organization described in this document is intended for refineries and is therefore not directly applicable to other less complex oil installations. The limitations in terms of manpower and the need for more outside assistance in such installations as terminals and marketing depots will have to be recognized and dealt with as appropriate. However, the general principles of the emergency planning advocated in this document do apply to these installations as well.

The key to safe operation is effective risk management. This involves assessing consequences should a problem occur, and judgements about acceptable levels of risk. Hazards can be reduced but not eliminated by safe working practices in the framework of safety management. All staff need to be vigilant in ensuring safety and proactive in seeking to reduce risks.

The degree of responsibility of the manager of a refinery can vary from one country to another according to national regulations and will have to be borne in mind when setting up emergency plans.

Management must satisfy authorities that both plant design and operating practices are adequate to ensure safe operation, and that effective emergency contingency planning is in place On-site (the On-site Emergency Plan). Authorities are responsible for Off-site emergency contingency planning, but industry must provide the information on which authorities base their emergency plans (the Off-site Emergency Plan).

A necessary part of industry's responsibility is to inform workers and members of the public who might be affected by an incident, of actions that they should take to protect themselves. Such

information needs to be provided in appropriate ways before and at the time of occurrence of any incident. It is appropriate that some information should be passed directly to the public by industry, but always in close consultation with authorities.

This paper is intended to highlight aspects that need to be considered during the development of emergency plans for dealing with occurrences endangering life and property. Whilst it provides a framework, each operating location needs to make its own contingency plans, suited to its own local situation and based on potential hazards particular to its own activities.

An emergency organization is suggested, important responsibilities described and some typical actions for various emergency cases proposed. A description of potential events and consequences serves to make the reader aware of possibilities, thereby assisting the formulation of relevant scenarios.

Last, but not least, training is emphasized. For the plan to be effective, key personnel and professionals must be trained in their emergency roles, both individually and as members of a team. Regular simulations of credible events are recommended as the best way of testing the plan and the readiness of key personnel.

2. OBJECTIVES OF REFINERY EMERGENCY PLANNING

When an emergency occurs the main concern is to preserve life and safeguard property and the environment. Therefore an Emergency Contingency Plan, catering for both minor and major emergencies needs to be designed with the following objectives:

- rescuing people
- treating the injured
- safeguarding others
- minimizing damage to property and environment
- controlling the incident, removing the hazard, preventing escalation
- maintaining the welfare of personnel involved in controlling the occurrence
- identifying casualties
- informing and assisting relatives
- informing the news media
- informing/collaborating with the authorities and emergency services
- preserving records

The need for further collaboration with the authorities should lead to the improvement of community emergency plans and overall emergency networks. Both the authorities and refinery management should ensure that On-site and Off-site emergency plans have consistent objectives and are properly coordinated.

3. THE NATURE AND EXTENT OF EMERGENCIES

3.1 NOTIFICATION OF HAZARDS

The Seveso Directive requires manufacturers using more than certain quantities of explosive, flammable and/or toxic substances to notify their national competent authorities to ensure that these hazards have been recognized and that measures have been taken to prevent and control accidents, and to minimize consequences. These requirements apply to refiners.

The notifications consist of written reports giving information under 3 main categories:

Information relating to the establishment:  
· substances, installation, location

Risk analysis:  
· risk identification (causes, consequences)

Risk management:  
· preventive measures  
· On-site emergency plans in the event of an accident

3.2 EVALUATION OF HAZARDS

The methods generally used to identify, evaluate and control hazards are based on two approaches:

Experience and adherence to good practice.  
By ensuring that internationally accepted and good industrial practices are adhered to in design, engineering, construction, operation, maintenance, organization and administration, a high level of safety can be attained. The controls include checklists, safety reviews, supervision, inspection programmes, and management audits.

Technical Safety Studies.  
New designs of installations that are different from established practice are usually checked by one of three methods - "HAZOP studies", "Failure Modes, Effects and Critical Analysis" (FMECA) and the "What If Method".

Many of the available evaluation methods have been developed to identify the hazards that exist, the consequences that might occur, and the likelihood of their occurring.

### 3.3 INITIATING EVENTS

Any one emergency will be unique, because the factors underlying the event, and possibly those causing escalation, may be specific to the condition of the hardware, the manner in which the situation is handled and the effectiveness of the control.

In refineries dangerous events which might be anticipated are:

- release of flammable vapour clouds which may give rise to fires or explosions;
- release of flammable liquids/mists followed by pool or flash fires;
- release of toxic gases;
- internal fires/explosions due to air ingress into equipment containing hydrocarbons;
- internal explosions due to hydrocarbon ingress into air systems;
- water/hot oil explosions;
- fires from pyrophoric matter, oil soaked lagging and other spontaneously combustible material;
- spillages of heavy hydrocarbons with soil/water contamination;
- pollution by toxic liquids and lead alkyls.

These events could be caused by corrosion, equipment failure or malfunctioning, design deficiencies, human factors (human error or deliberate act), or natural conditions (storm, flood, tidal wave, earthquake).

### 3.4 CONSEQUENCES

Normally the consequences of an emergency will be confined within the refinery fence. In the event that an emergency cannot adequately be contained within the site, injury and damage to property and the environment may occur outside the perimeter. These latter cases are of the utmost importance and should form the basis for Off-site emergency plans prepared by the local authorities in cooperation with industry in the area. The approach taken will depend on how preparedness is achieved locally (refer to Section 5).

The consequences of accidents may not be limited to damage to people, property and the environment. Business can be affected through loss of sales, customer relations harmed through legal action by others (civil, criminal proceedings, compensation payments and costs of litigation) and loss of reputation and good will.

Apart from the On-site activities to contain the emergency and minimize its consequences, the Off-site response actions could include advice to the population to take shelter in their houses or evacuate, and rescue of those injured or at risk.

With these serious consequences in mind, the following matters should be addressed when making contingency plans:

Nature and extend of injury, property damage and environmental destruction taking into account possible (aggravating) factors like containment of used firewater, changing weather conditions, congestion of people, proximity of other installations, populated areas, waterways, railways and roads?

What resources, in terms of equipment, manpower and organization, will be required to reduce serious consequences, safeguard people and control the event?

Are local emergency services available, hospitals, ambulance services and fire brigades?

Who will be in charge of the emergency once police and/or fire brigade have arrived, and how will they be informed of the special hazards resulting from the emergency?

What further provisions, actions or arrangements would be needed both for prevention and protection?

Are Mutual Aid arrangements possible with neighbouring sites/companies and others?

#### 4. THE ON-SITE EMERGENCY PLAN

##### 4.1 GENERAL

This chapter proposes a model On-site Emergency Plan which can be adapted to suit local circumstances for virtually any refinery site. It covers typical foreseeable emergencies in refining activities and examines the related consequences in order to determine action plans and resource requirements.

Typical events considered are:

- fire and explosion
- release of vapour and gas
- oil or chemical spillages
- medical emergencies
- natural disasters - storm, hurricane, flood
- terrorism and sabotage

In essence the Plan consists of having key personnel on standby duty and providing emergency services which are readily available. These elements are put together in an emergency organization which structures reporting relationships and defines the line of command. Responsibilities of key personnel, control and support services (both internal and external) are described. Communication networks are developed in detail. External support arrangements, where available, are defined. These may be with government services or agencies, local clinics and hospitals, or may cover mutual aid arrangements with other industries.

In preparing the emergency plan distinction should be made between incidents with consequence limited to the refinery premises (covered by the On-site plan), and the incidents which can reasonably be foreseen as having damaging effects on the local community and property (covered by the Off-site plan).

This Section 4 limits itself to the On-site plan. For advice to refineries on their responsibilities with respect to the preparation of the local authority Off-site Emergency Plan refer to Section 5.

##### 4.2 THE ORGANIZATION

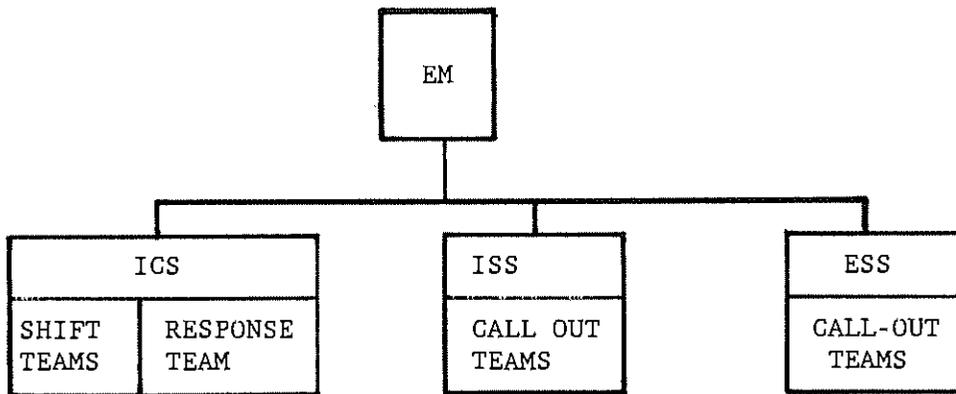
The complexity of the organization in place at an installation is related to the installation and its manpower establishment.

The example which follows describes a typical emergency organization within a medium-sized refinery. All appointments are normally made by the Refinery Manager in writing.

In the event of an emergency incident, the Operations team (supervisor and operators) immediately take initial control measures. In the case of an emergency that cannot be controlled by the Operations team, the Local Emergency Organization will then be progressively activated as necessary. The overall control and responsibility for coordinating the activities rests with the Emergency Manager, or with the Shift Superintendent until the Emergency Manager arrives in the refinery. A simplified emergency organization is illustrated in Fig. 1.

Fig. 1 Basic Location Emergency Organization Chart

EM = Emergency Manager  
 ICS = Internal Control Services  
 ISS = Internal Support Services  
 ESS = External Support Services



- operations
- movements
- marine
- engineering
- mechanical
- electrical
- instruments
- civil
- firefighting
- security
- medical

- deputy EM
- firefighting (aux.)
- personnel & public relations
- technological
- general services
- mutual aid coordinator
- additional personnel

- firefighting
- medical
- police
- port authority

The first action is that the following Response Teams move to their predetermined reporting locations:

- (1) Fire service on shift.
- (2) Security force on shift.
- (3) Medical service on shift.
- (4) Emergency Manager.
- (5) Department heads or duty officer for:
  - operations
  - movements
  - marine
  - engineering
  - firefighting
  - medical
  - security
  - emergency/safety services

These Response Teams, together with shift personnel of all departments, form the Internal Control Services. As necessary, the Emergency Manager will then call upon the Internal Support Services consisting of the following Call-out Teams:

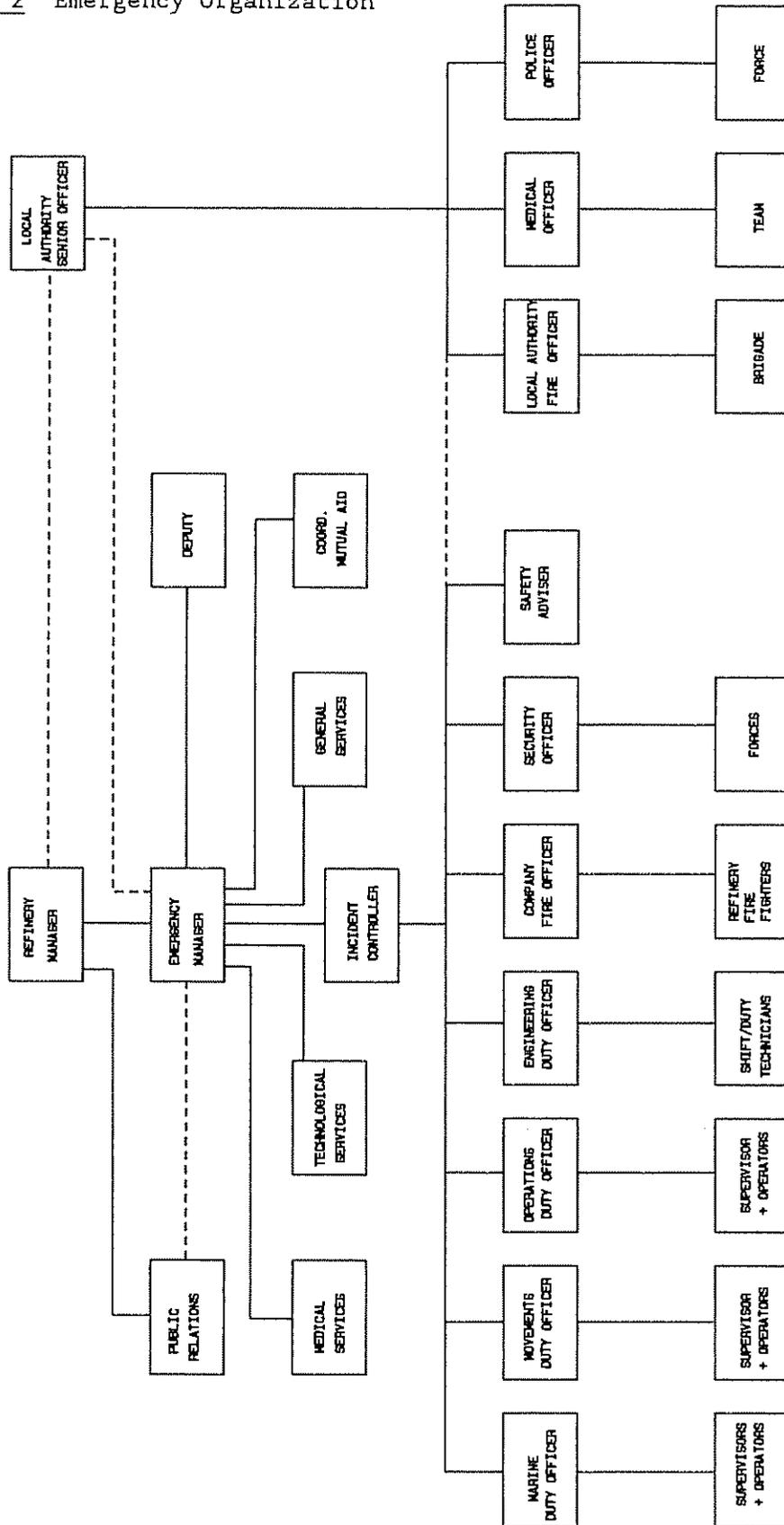
- deputy emergency manager
- auxiliary firefighters
- auxiliary first aiders
- personnel and public relations
- technological services
- general services
- Mutual Aid coordinator
- additional personnel via telephone call lists

Outside normal working hours, or in the absence of key personnel, the responsibilities are delegated to persons on "duty rosters".

Additionally, depending on local circumstances, the Emergency Manager may call upon External Support Services via special arrangements or in compliance with legal requirements. External Call-out Teams could come from the local Police, local Port Authority, local Fire Brigade and local Medical Agencies or Health Authority.

A specimen organization chart showing interactions with local authority personnel is shown in Fig. 2. It will be obvious that in smaller organizations more than one responsibility may be carried by one person.

Fig. 2 Emergency Organization



#### 4.3 RESPONSIBILITIES DURING EMERGENCIES

It should be borne in mind that at the outbreak of an emergency there may be limited manpower immediately available on site, normally restricted to the operations shift crew only. The delay in arrival of nominated key personnel in the emergency organization will vary greatly with the time of the start of the incident. During daytime on week-days staff are readily available from offices and the works. During night hours or weekends staff have to be contacted and need time to reach the refinery.

The most senior manager at site (which for the reasons given above is often the Shift Superintendent) will therefore initially need to assume the combined responsibilities of the Emergency Manager, the Incident Controller and frequently that of Fire Officer in addition to his own prescribed responsibilities. Upon arrival of the appropriate key functionaries he is relieved of these responsibilities.

For the Shift Superintendent to be able to execute these extended responsibilities in the initial phase of the emergency, the precise emergency task of each shift team member must be clearly defined.

The various fields of responsibility in the emergency situation can be described as follows:

##### i) The Emergency Manager

The Emergency Manager is responsible for overall coordination and control. He therefore:

- conducts the On-site appraisal and defines or confirms the emergency category (Section 4.5);
- puts the relevant Emergency Call-Out Plan into effect;
- sets up office in the Central Emergency Control Centre;
- considers the need to activate a Forward Control Centre as the situation so warrants;
- ensures that the required support services are available;
- ensures that the Medical Emergency Plan is executed, e.g. first aid stations operational, casualties receiving adequate treatment, transport of the injured to clinics/hospitals, arranging for additional medical expertise or help as required;
- makes arrangements for search and counting of people;

- ensures that the operational containment actions are progressing, e.g. isolation of source of the problem, emergency shutdown/depressurizing, pump-out, movements/marine actions;
- confirms that the relevant firefighting/emergency tactics and actions are in progress, in consultation with those in direct charge of these activities;
- controls, via the security force, the traffic in the area, arranges for road blocks in consultation with his key officers;
- arranges for the relief of key personnel when the emergency situation is prolonged;
- 
- ensures that general support services are provided, e.g. catering, correspondence/telexes, weather reports etc.;
- liaises with the External Support Services and the authorities;
- ensures coordination of mutual aid support;
- arranges for personal information/support for relatives of those injured;
- makes arrangements for an emergency log;
- agrees the content of statements to the news media via the personnel and public affairs officer, for authorization by the Refinery Manager;
- ensures that steps are taken to preserve evidence and records, which is important for the subsequent investigation into the causes of the incident;
- initiates the post-emergency rehabilitation of the area;
- makes arrangements to investigate the incident and the response operation, and to prepare a report to management.

ii) The Incident Controller

The Incident Controller may be the Department Head or the Shift Superintendent. He reports to the Emergency Manager, is in direct charge of the operational containment actions and has overall responsibility for the integrated emergency actions in the field of fire-fighting and operations.

The Incident Controller will:

- ensure that all necessary operational actions are initiated such as isolation of source of leakage, emergency shutdown, decommissioning of facilities in distress or endangered, depressurizing, and other emergency actions as required;
- oversee the overall direction of the fire-fighting tactics;
- ensure that the fire-water pumps are performing satisfactorily and are continuously monitored;
- coordinate initial personnel evacuation;
- oversee initial rescue of injured and trapped personnel;
- ensure that personnel make use of appropriate life-supporting and protective equipment;
- ensure that the installed plant protection facilities have been activated and are functioning;
- inform the Emergency Manager of any existing or potential hazards which may have a bearing on the incident control tactics e.g. gas release, overflowing drains, structural collapse, or other escalation of the incident;
- coordinate essential processing and emergency arrangements with other processing/movements sections, e.g. product and process materials rundown/supplies, utilities;
- arrange engineering services for e.g. spading, blinding flanges;
- ensure that appropriate marine emergency actions are taken in coordination with the appropriate harbour authorities (e.g. deberthing of tankers);
- liaise with local authorities and company fire officers;
- liaise with other officers (medical, safety) to ensure the transfer of advice and information;
- ensure that the area has been made safe (e.g. no ignition sources, road blocks, no open bleeders or vents);

- supervise post-emergency activities in the problem area;
- keep the Emergency Manager fully informed on the progress of the emergency actions and requirements.

iii) The Medical Officer

The Medical Officer is the company's doctor, the chief nurse or the medical duty officer at the time of the emergency. He reports to the Emergency Manager. In an emergency he will:

- activate the Medical Emergency Plan (see Section 6.8);
- be in direct charge of all first aid activities in the emergency area and on the refinery during the incident;
- provide required materials at site for initial first aid (e.g. to stop bleeding, cover wounds with sterilized compresses from burn kits, neutralizing agents for counteracting chemical burns);
- ensure that casualties are transported to the first aid station/clinics;
- ensure that the patients are receiving appropriate medical attention and, where necessary, are transported to the nearest hospital;
- inform the Emergency Manager of additional external medical requirements, which may be necessary in circumstances not sufficiently covered by the emergency plans;
- liaise with External Medical Support Services and health agencies once they are on site.

iv) The Fire Officer

The Fire Officer is the company's chief fire officer or the fire duty officer at the time of the event. In this capacity he commands the fire brigade, which may comprise professional, semi-professional and auxiliary firemen, and which uses firefighting vehicles, foam tenders and other equipment. He reports to the Incident Controller. Where local authority fire brigades attend an incident, local regulations may require that the control of the firefighting is passed to local authority personnel.

Prior to the event he will have drawn up fire plans and rescue plans for all foreseeable events. The plans include

listing associated hazards, resource needs for fire protection and for control and extinguishment of the fire. The Fire Officer will also regularly appraise the adequacy of available equipment, training and rehearsal arrangements.

During the emergency the Fire Officer is responsible for the combat of the emergency and rescue of the injured and those trapped. He will:

- decide on fire protection measures and firefighting strategies and tactics in consultation with the Incident Controller and local authority fire officer;
- decide on rescue tactics in consultation with the Emergency Manager and Incident Controller;
- in the case of a gas release, decides, in consultation with the Incident Controller, on tactics to prevent ignition/explosion, to disperse the cloud and to protect personnel;
- be in charge of the deployment of professional and other firemen, fire tenders and equipment;
- keep himself apprised of foam stocks, informing the Emergency Manager who will make provision for additional supplies as necessary;
- ensure that the performance of the firewater mains is monitored and that water use does not exceed supply capacity;
- in the case of a tanker fire alongside the jetty, protect the shore facilities and render assistance to the tanker only when it is requested by the Master via the Emergency Manager;
- keeps the Incident Controller and the Emergency Manager informed of the progress of the combat and rescue actions.

v) The Shift Superintendent

The first direct response comes from the personnel at the location of the incident. The Shift Superintendent will make the first response to the incident. He will:

- raise the alarm/warning;
- activate fixed protection equipment (e.g. sprinkler systems, water curtains, fire monitors);

- carry out initial rescue and firefighting, employing appropriate combat and protective equipment;
- stop or minimize fuel flow;
- inform security (for traffic control), fire station and other site areas about the situation;
- make the process equipment involved in the event safe by isolation of source of leakage, depressurizing and/or shutting down, as necessary;
- request assistance from others (e.g. engineering, medical).

vi) Other On-Site Responsibilities

As the incident progresses, the responsibilities for additional matters will be activated by the Emergency Manager, who may request appropriate assistance on the following matters:

- communication systems
- engineering and technology
- personnel and public information, including relations with news media
- reception and welfare of personnel/families
- Mutual Aid coordination

The Emergency Plan should identify those persons in the refinery who have relevant expertise in these subjects and their names should be included in a specialist call-out list which is regularly updated. When called upon, the specialists will proceed to a pre-determined assembly point.

## 4.4

### EXTERNAL SUPPORT ARRANGEMENTS

i) General

In the event of a serious emergency, depending on the individual legal environment or on particular circumstances, certain government agencies/authorities are to be notified without delay. Some governmental bodies have "inspection" responsibility/capacity, while others may provide control or support. External support arrangements for dealing with emergencies are quite common in industry, the following third parties typically being involved:

- authorities (police, port, coastguard)
- government agencies (environmental, safety and health)

- medical services (ambulance, paramedics)
- fire services (tenders, manpower, salvage)
- marine services (tugs, fire tenders)
- helicopter services
- pollution control
- suppliers (foam, TEL/TML)
- contractors
- Mutual Aid partners

ii) The Authorities

Procedures and responsibilities for local authorities in connection with emergencies exist in many countries. Depending on the type of emergency, the authorities have to act to preserve law and order, regulate traffic and assist in rescue operations. It may, therefore, be necessary to maintain direct communication with these authorities throughout a serious occurrence.

Whenever possible, contingency arrangements should be made with the Fire, Police, Pollution and Health Services. The structure of the arrangements may differ considerably between localities. For instance, there may be a legal requirement that the Municipal Fire Service assume command in cases of fire. The other extreme is that assistance is rendered at the request of the industry and at the discretion of the municipal organization. However, irrespective of this situation, all arrangements for contact with authorities must be clearly defined within the Emergency Plan e.g.:

- definition of roles and responsibilities
- leadership
- coordination of efforts of internal and external resources
- communications

iii) Medical Services/Hospitals

In emergencies the company's medical department should be able to mobilize further medical and ambulance services. In making arrangements for back-up services consideration should be given to possible numbers of casualties and type (e.g. heat and chemical burns).

iv) Mutual Aid Arrangements

In developing these arrangements companies should take into account the support capabilities, facilities, materials and equipment available in the area, and establish liaison links needed for the rapid deployment of such assistance. Formal arrangements and procedures should be agreed and included in the contingency plan. An exchange of plans and data about

emergency material and equipment belonging to the various parties involved will form part of such arrangements. Examples are compatible fire-fighting equipment, materials (e.g. foam concentrates and neutralizing agents) and manpower (firemen and medical personnel).

Note: Further detailed information on mutual aid is contained in CONCAWE Paper "Planning for Mutual Aid" (see CONCAWE Report No. 5/88).

#### 4.5 ACTIVATION OF THE EMERGENCY ORGANIZATION

The Emergency Plan should define Emergency Categories as well as dealing with typical scenarios. The purpose of assessing and categorizing emergencies (sizing up) is to allow standard responses to be initiated with a minimum of decision making.

An alarm is raised by the first person discovering an incident, which in almost all cases is a first stage fire alarm. Sizing-up consists of a rapid assessment of the situation, i.e. the type, extent and severity of the emergency, whether casualties are involved, the immediate problems of handling the incident and the potential for escalation. This assessment, in the initial stages nearly always carried out by the Shift Superintendent, forms the basis for categorizing the incident according to its scale and severity: the selected category in turn determines a number of pre-planned responses which bring in the appropriate level of outside help.

There are variations in category definitions, but the following may serve as an example:

##### Fire - minor

A relatively small-scale fire that can be handled by the first stage of fire-fighting response. The first-stage fire alarm is raised.

##### Fire - major

A major fire requiring substantial assistance from back-up second stage fire-fighting resources, which may include assistance from the local authority fire service. The second-stage fire alarm is raised (in most cases after the 1st stage fire alarm has sounded first).

##### Flammable or toxic vapour release

A flammable or toxic vapour cloud incident with potential for explosion and casualties. A dedicated gas alarm siren should preferably warn those on site that a gas alarm has been raised.

## Other incidents

All other incidents involving casualties or having the potential for casualties. The Emergency Medical Plan and first or second stage fire response should be initiated as appropriate.

### 4.6 EMERGENCY CONTROL CENTRE(S)

The emergency control centre is a place from which the emergency operations are controlled and coordinated. It may be desirable to have forward (mobile) and central emergency control centres, as there may be circumstances with widespread consequences which are better controlled from a fixed location while the more localized emergency would be best handled from a centre close to the site of the event. The location of the forward emergency centre will be dictated by the circumstances at the time of the incident. Some situations would require both types of control centre. The control centres should be clearly marked and equipped with such items as:

- adequate numbers of telephones (internal/external communications)
- radio equipment
- refinery plot plans and area maps showing
  - . access/exit roads
  - . processing areas
  - . movements areas and tank farms
  - . jetties and water front
  - . storage capacities of hazardous materials
  - . buildings
  - . radioactive sources
  - . gas dispersion diagrams
  - . fire station and equipment
  - . first aid stations/clinics
  - . drainage systems
  - . fire protection systems
  - . populated/residential areas
  - . assembly points
- process and engineering flow schemes
- telephone/address lists of key personnel
- telephone/address lists of external emergency services
- stationery and marker boards
- working maps which may be marked up during the emergency

- updated Emergency Procedures and Manuals (define frequency and allocate responsibilities for updating)

#### 4.7 LOGISTICS

It is essential to make an evaluation of the logistical requirements of each incident scenario. The factors to consider are in relation to the incident and its duration will include:

- combat manpower and number
- type and quantity of combat vehicles/equipment
- treatment facilities
- casualties, type and number
- trapped personnel/residents
- back-up facilities

Predetermining the requirements for any one scenario is very difficult, but it is important to know where to get the resources when required.

#### 4.8 COMMUNICATIONS

The time factor is obviously critical in emergency combat operations. The sense of urgency that everyone experiences may lead to a chaotic situation if communications do not function properly. The systems used would be a mixture of:

- radio systems
- direct telephone links (hot lines/red telephones)
- telephone
- personal/messengers

Personnel who use radios should be acquainted with the operation of the equipment and special procedures to facilitate understanding.

To avoid confusion in radio communications it is advisable that the Emergency Manager uses one dedicated frequency for communicating with all the officers reporting to him, while each officer would in addition have the use of his own dedicated frequency for communications with his respective team.

Communications between Emergency Control Centres, the fire station, operations control centres, the first aid station, the communications centre and the security station should, it is suggested, be via direct telephone links ("hot lines"), wherever possible.

In the event of failure of the installed communication systems use will have to be made of messengers. Allocation of such duties will have to be foreseen in the emergency plan.

4.9 GENERAL SERVICES (PERSONNEL AND FAMILY WELFARE)

The team members responsible for these activities will normally belong to the personnel or other administrative functions. Their activities cover a wide array of tasks ranging from simple mail/telex services and catering for personnel transportation, accommodation of evacuees and support of the families of the casualties.

Medical information to next of kin should be supplied by medical specialist/doctor (see Section 6.8 iii). In some countries the police may take over this task.

4.10 PUBLIC RELATIONS, HANDLING OUTSIDE GROUPS

These responsibilities should be allocated to a designated officer. Public information should be cleared by the Refinery Manager before publication or issue.

It is to be expected that various outside organizations and individuals will contact the refinery by telephone or in person soon after the start of an emergency incident. These approaches are likely to come from TV/radio, newspaper reporters and photographers, relatives of on-shift employees, local residents, neighbouring industry and others, all of whom may have legitimate motives. However, if these callers are not handled effectively, they may introduce problems such as overloading the telephone system, unauthorized entry into the refinery, and inaccurate or even hostile news media reporting.

The On-site Emergency Plan must therefore make provisions for handling these outside groups, including the following:

Segregation of external emergency telephone communications, and means of responding to other incoming calls which only require information (e.g. by recorded message).

Security arrangements at all refinery entrances to prevent entry of unauthorized persons, while at the same time allowing proper reception, briefing and direction of emergency services and personnel.

Direction of news media reporters to a designated reception room where a senior refinery representative will be available as soon as possible to brief them. The latter role should be included in the responsibilities of one of the key personnel in the emergency organization. (The reception room may be at an outside location).

After the event it is important to give prompt information to refinery personnel and to inform them of the state of health of any victims.

4.11 EMERGENCY MANUALS

Emergency manuals should be designed to contain all the information required for a rapid and effective response/call-out/combat during an emergency. The first part of the manual should describe the overall organization and the communications networks. This should also concisely depict the initial response action for various types of emergencies, e.g. the initial response actions for operators at the site of a fire, or response actions for the medical department or security forces immediately after an alarm. In essence this should be a form of checklist of actions for the various teams. The manual should also give detailed descriptions of all external support arrangements and mutual aid agreements with others, telephone numbers and addresses of important persons, authorities, third parties, Head Office and Central Office contacts.

The subsequent parts of the manuals should set out detailed actions and strategies to be followed by the various teams involved in the emergency control operations, covering strategies and tactics for specific occurrences/credible events.

Note: Further detailed information on how to develop an emergency manual is contained in CONCAWE paper "Content of Emergency Plans" (see CONCAWE Report No. 5/88).

5. THE OFFSITE EMERGENCY PLAN

5.1 INTRODUCTION

The EEC Seveso Directive requires a major hazard installation such as a refinery to provide the local authority with technical information on incidents which can be foreseen and which could have damaging effects on the local community, property and the environment. These cases have to be identified and the nature and extent of the consequences estimated, to form a basis for preparation by the local authority of an Off-site Emergency Plan, the primary objective of which is to protect the local community and the environment.

This Chapter is intended to give refinery staff advice on their responsibilities with respect to the preparation of the local authority Off-site Emergency Plan, and to indicate the probable content of the Off-site Plan.

5.2 REFINERY RESPONSIBILITIES AND ACTIONS

There will be differences of implementation of the Seveso Directive between the EEC countries, and refinery managements should first seek professional advice on the following questions:

What are the detailed requirements (including timing) of national legislation with respect to emergency plans?

How are other installations and other companies within the country responding?

What initiatives should the refinery take to open discussions on emergency planning with the local authority?

Have Off-site Emergency Plan scenarios and calculation procedures for predicting consequences been specified by the local authority, or would proposals be accepted?

Regardless of the requirements of local legislation, it should be company policy to take a responsible attitude towards the protection of the neighbouring community. In all cases one should follow a supportive and constructive approach in contacts with the local authorities, not only to ensure that an effective Off-site Plan, consistent with the Refinery On-site Plan, is produced, but also to meet the relevant statutory obligations.

It is recommended that, having established the specific requirements of national legislation, each refinery takes the

following steps to prepare the required input to the local authority Off-site Emergency Plan:

Identify and evaluate incident scenarios that would create hazardous conditions outside the refinery perimeter, and quantify the consequences.

Establish a channel of communication with the local authority by which the refinery will meet its obligation to provide information for preparing the Off-site Emergency Plan. If appropriate, this should be extended to a more positive role in contributing to the formulation of the Plan.

### 5.3 CONTENT OF THE OFF-SITE PLAN

The Off-site Emergency Plan for the refinery will be prepared by the local authority, and will be, in effect, a special case within their general plans for handling disaster-scale incidents such as floods, aircraft and rail crashes, other major industrial fires or explosions, extended pollution, terrorist attacks.

The general structure of the Off-site Plan will probably be based on established local authority disaster plans, covering aspects such as:

- organization and command structure for control and coordination of police, fire, medical and other public emergency services;
- key personnel and responsibilities;
- communications systems;
- traffic and spectator control;
- procedures and means of communication for instructing the local community to evacuate or take shelter;
- provision of temporary accommodation for people who have had to leave their homes;
- contacts with the news media and with relatives of casualties (non-employees).

The Off-site Plan for a major refinery incident should be consistent with and linked to the Refinery On-site Plan, and the overall organization and command structure should be detailed in the Off-site Plan.

Problems specific to a refinery incident need appropriate actions to be prescribed in the Off-site Plan to protect the local community.

The most critical of these actions is the instruction to be given to the local population in actual or impending situations of dangerous heat radiation, toxic vapour release, or blast from an explosion. Some authorities take the position that when limited response time is available, the safest action, rather than evacuation, would be for people to take shelter in their houses in rooms facing away from the refinery, with windows, doors and curtains closed, and with ventilation and fired heating systems shutdown.

Consideration should be given in the Off-site Plan to neighbouring high-occupancy establishments, e.g. schools, sports grounds, or cinemas, where special emergency procedures for major incident situations would be appropriate.

#### 5.4 INITIATING THE OFF-SITE PLAN

The Off-site Plan would be initiated if there were actual or potential hazardous conditions outside the perimeter as a result of a refinery incident.

Some incident scenarios with potential for Off-site injury and damage might be:

A major fire with no danger of explosion. The hazards are prolonged high levels of thermal radiation and smoke.

A major fire threatening storage facilities containing hazardous materials with imminent danger of explosion and threatening the area.

Release of toxic vapours threatening the area with or without fire.

The Off-site Plan could also contain arrangements for post-event rehabilitation. This includes rescue of casualties (e.g. after an explosion), rectification of damage to people, property and the environment, and properly dealing with claims.

Initiation of the Plan would be the responsibility of the senior officer of the authority emergency services present, in consultation with the Refinery Emergency Manager.

5.5 INCIDENTS ORIGINATING OUTSIDE THE REFINERY

Handling a road, rail or pipeline transportation emergency involving petroleum products or chemicals in the general surrounding area would normally be the responsibility of the local authority emergency services, but they might request specialist assistance from the refinery as its resources are available around the clock. Such a request might arise even if the refinery had no direct involvement or liability in the incident.

Although such incidents would not be within the scope of the On-site or Off-site Plans for the refinery, it may be desirable from "good neighbour" considerations to agree to provide assistance and to formalize the agreed arrangements and procedures in advance of any incident. Such arrangements should of course be subject to review by the company legal department.

6. TYPICAL EMERGENCY ACTIONS FOR DIFFERENT SCENARIOS

6.1 GENERAL

As described earlier, it is essential that all reasonable measures should be taken to prevent unwanted occurrences. Management should ensure that the safety integrity of the refinery's systems are not compromised. Operations should be conducted according to standards for safe operation as laid down in up-to-date Operation Manuals. Routine maintenance, overhauls and plant changes must conform to Codes of Safe Practice. However, it is also essential that any operational failure or malfunction is detected early and that rapid initial response allows early and safe containment. This section describes in a general fashion some countermeasures pertaining to certain categories of emergency.

6.2 FIRES AND EXPLOSIONS

i) Appraisal of the Situation

Each incident is unique and the first impression is often one of a confused situation. Because of the individual character of each emergency it is not possible to develop procedures for every possible event, but the general principles remain that refineries should have emergency action plans for relevant credible events.

The fire action plans in the various cases will have different and common elements. However, the Emergency Manager and his officers in direct charge of the area in distress and of the fire and medical services should carry out a systematic appraisal of the situation, covering the following matters:

- casualties
- missing personnel
- evacuation of non-essential workers
- source and extent of release of fuel and fire
- flammable/toxic nature of the release
- equipment involved
- status/condition of emergency systems
- possible means of isolation of the source of hazard
- removal of ignition sources
- control of the spread of fire
- other possible means of control
- firefighting and rescue tactics
- resource requirements, activation of the call-out plan (see Section 4.5)
- further tactics

Continual review and appraisal is required to determine possible developments and the course of events, so as to deploy appropriate measures.

ii) General Principles of the Firefighting Plan

The fire control actions focus on starving the fire by removing the source of fuel as quickly as possible. This might be accomplished by isolation of the source of fuel or depressurizing the fuel source. In cases where immediate removal of the source is not successful a deliberate attempt should be made to have a controlled fire instead of extinguishing it, since in the latter case reignition and explosions could result or toxic vapours would endanger firefighters and other personnel. It is essential that these aspects are appreciated in order to prevent any serious escalation as a result of the wrong tactics.

The following action list might be helpful:

If people are at risk, direct properly attired and equipped rescue teams to their protection.

If possible, prevent release of combustible vapours/liquids and depressurize process facilities involved.\*

Isolate electrical circuits not required for controlling the hazard.

Investigate what other process actions are essential.

Isolate ventilation to affected confined spaces, e.g. control rooms.

Investigate method and approach for containment and firefighting.

Determine escape routes and provide signals to that effect.

Determine locations for siting firefighting appliances.

Apply cooling to adjacent equipment to prevent aggravation of the situation (cooling with water may not be acceptable).

\* Note: LPG storage vessels exposed to fire should not necessarily be emptied providing water spray protection is available.

Use properly equipped firefighting and rescue teams provided with breathing apparatus and other relevant protective equipment, supported by back-up teams, when necessary.

Prevent flow of combustibles on surface water drain systems (fire traps).

Stop flow of combustibles to other undesirable directions (e.g. use sand, sandbags).

Attempt to blanket burning liquids in open spaces with foam.

When the fire has been extinguished, prepare to secure the affected areas, spray with water to disperse possible vapour clouds and continue to cool down to ensure there is no chance of re-ignition.

### iii) Initial Operations Response Actions

Apart from the first actions to safeguard life, (hot work stopped, evacuation of non-essential workers, use of safety and life-supporting equipment), the shift operating team will attempt to control the emergency in the initial stage by actions to remove or minimize undesirable effects. Fire protection facilities, e.g. water curtains, fire monitors and sprinkler systems, must be activated at once in the case of fire in the immediate vicinity. Simultaneously, isolation of the fuel being released has to be effected, if possible. If the attempts are unsuccessful, it must be decided whether or not to attempt to extinguish the fire with local portable fire extinguishers; this decision depends on the nature of the fuel being released. The emergency alarm/ warning must be sounded. Subsequent actions are intended to reduce the quantity of fuel released:

- emergency shutdown;
- depressurizing equipment involved;
- removing flammable/toxic inventory, where appropriate.

### iv) Firewater Drainage

The flow of burning liquids in undesired directions has to be prevented so as not to endanger other equipment and personnel. It is therefore essential to:

- prevent the spread of fire through drains;
- improvise a safe temporary diversion of drain water if necessary;

- avoid flooding of sewers, oil traps and oil catchers, by pumping out when necessary;
- prevent overflow of tanks and vessels;
- prevent overflow of tank bunds and improvise additional safe drainage when necessary;
- prevent spread of fire on surface waters.

v) Termination of the Emergency

After regaining control and extinguishing the fire, the immediate follow-up actions should be taken to:

- prevent reignition of spilled fuel;
- check and confirm that no flammable/combustible fluids are continuing to be released;
- maintain standby of fire and emergency equipment and services;
- continue "cool down", if necessary;
- check for toxic vapours;
- restrict entry into affected areas/sites;
- check for potential collapse of damaged equipment;
- safeguard surrounding area as necessary;
- establish safe plant/installation conditions;
- give the "all clear" signal so that interrupted activities elsewhere can be resumed and the routine restored;
- investigate the incident, establish the cause and any required corrective measures and compile a report;
- consider legal obligations, fulfil statutory reporting requirements.

6.3 RELEASE OF FLAMMABLE/TOXIC GASES

i) General

Prevention of gas leaks is extremely important - the more toxic the gas the more important the prevention. When

recognized safety codes and practices are strictly observed, the probability of leakage, toxicity injuries, fires and explosions will be minimized. The next step is to minimize the effects of the incident once it has occurred. The important feature is early detection and rapid safe initial response with the objective of isolating the source of the release. In the following paragraphs some typical measures to be taken in the case of gas release (toxic and/or flammable) without ignition are discussed.

ii) Principles of Handling Gas/Vapour Emergencies

Upon detection it will not immediately be known to what extent the vapour cloud has spread. In addition to the area alarms, a special signal (gas alarm) should be sounded to warn others of the special conditions and to alert response personnel of the nature of the emergency. Additional dispersion data may be available when detection and warning networks have been installed in the refinery and surrounding area.

The most important actions to be taken, which should automatically be prompted by the sounding of the gas alarm, are:

- stop all hot work;
- all non-essential staff to evacuate the areas in distress against the wind direction;
- people working in confined spaces to be assisted to the open air;
- close off roads to traffic around the distress area;
- suspension of all work permits.

Response teams, having been informed of the location and nature of the emergency, will don full protective equipment and will approach from upwind. All vapour clouds will expand. In cases where the leak has been suppressed the cloud might follow a distinct path, depending on its location (inside/outside process area), the wind strength and direction and the nature of the vapour/gas. Personnel involved in dispersing the cloud by means of water sprays must take strategic positions (preferably upwind) to keep the vapours away from critical areas such as ignition sources and air intakes for control centres and furnaces.

The handling of these types of emergency should be rehearsed by the simulation of credible incidents. Such situations can be described and used as the basis for "Gas Release Emergency Plans". Toxic/flammable gases and vapours to be considered include HF, H<sub>2</sub>O, SO<sub>2</sub>, chlorine, ammonia, fuel gas and LPG.

The initial response actions, following detection of any serious gas/vapour leak, will be to:

- raise the alarm, special warnings;
- inform communications centre of:
  - (1) location of leak
  - (2) nature of cloud
  - (3) possible extent
  - (4) wind direction
- don safety suits/breathing apparatus;
- evacuate the casualties;
- activate any fixed spray and sprinkler systems;
- where appropriate shut down furnaces which might cause ignition, stop air intake;
- shut down air compressors and other diesel engines in the path of the gas cloud;
- shut down air intake of control centre air conditioning units and close doors;
- attempt to isolate the leak;
- monitor concentrations inside/outside control centre(s);
- depressurize equipment involved in a safe manner;
- initiate dispersal of the cloud with mobile water spray equipment;
- close plant roads.

iii) Further Safety and Medical Actions

There must be adequate first aid and medical response in these situations as well. The Medical Emergency Plan should be activated. In this particular respect the direct concern is injury caused by toxic gases or vapours.

Auxiliary first aiders in the area of distress should have a plan of action covering their direct needs such as how to deal with hydrocarbon intoxication and initial treatment of injuries caused by exposure to hydrogen fluoride (HF) and hydrogen sulphide (H<sub>2</sub>S). For general use written safety instructions should be given to and rehearsed with all personnel working with or in the area of dangerous substances.

iv) Emergency Contingency Actions

The Emergency Manager's assessment concentrates on safety conditions, extent of the emergency, rescue of the injured, availability and use of life supporting/protecting equipment and clothing. The emergency control operation must be directed to isolating the source of release and simultaneously taking all measures to prevent ignition and to disperse the cloud. As the cloud itself may not be visible, caution is essential, as the risk of ignition may be considerable and the effect of the resultant heat release extremely severe.

Some aspects for the Emergency Manager to remember are:

- approach area from safe direction;
- use properly equipped firefighting and rescue teams;
- if people are at risk, direct rescue teams for their protection without undue risk to the teams themselves;
- stop release of vapours;
- ensure removal of ignition sources from path of cloud;
- ensure that the air intake to control centres in the area of distress has been stopped;
- arrange traffic control and road closures;
- keep cloud away from fixed ignition sources; disperse the cloud using water sprays, fog nozzles;
- use neutralizing agents;
- consider the required action in the case of ignition and make necessary provisions;
- reappraise the situation constantly and, if necessary, escalate the stage of the emergency and obtain more resources (or retreat);
- ensure that first aid and medical teams are operational;
- coordinate the activities of other emergency functions and inform management;
- when appropriate, terminate the emergency condition and make arrangements to investigate with a subsequent report.

## 6.4

### OIL SPILLAGES

Spillages may occur on land or water. It is accepted policy that whenever such a spill occurs immediate action should be taken to prevent further spillage, to prevent fire and to implement clean-up operations. The emergency plan must cater for small and large oil spills, using own facilities and those externally available. In many areas contractor services and equipment can be hired, whilst internationally reputable firms are available for dealing with disasters.

Spills on land are the simplest to handle. They normally require collection and transfer of the oil (e.g. with vacuum trucks or mechanical methods) and clean-up of oily mud (e.g. centrifuging or settling and draining followed by land farming or incinerating).

Special attention should be given to preventing the pollution of water courses and aquifers.

Spillages on surface waters are more difficult and require immediate emergency response. To prepare oil spill emergency action plans it is helpful to consider credible oil spill situations in areas where they might occur. The next step is to consider which anti-pollution strategy to apply, based on recovery or dispersal. Resource and equipment needs can then be ascertained.

The basic actions to combat oil spills on surface waters are:

- contain the spilled oil by deploying booms;
- skim for oil recovery;
- install back-up boom if necessary;
- use absorbent materials to remove final traces of oil;
- disperse any oil which cannot be contained and recovered (subject to local legislation or approval).

The refinery anti-pollution/oil spill combat organization is normally within the oil movements department or comes under the department for pollution abatement and control. Own resource requirements will depend on local externally available assistance, but should at least be sufficient to handle the common spill situation.

Legal requirements might set a minimum combat strength. For larger spills Mutual Aid arrangements can be beneficial.

The immediate emergency control actions following detection of a spill will follow a sequence such as:

- warn and mobilize relevant personnel, including relevant authorities;
- identify the person in charge of the overall operation;

- wharf crew and supervisor proceed to site to arrange containment;
- stop spillage by isolation of source;
- establish the nature of the material;
- put out primary boom (if possible);
- arrange to take sample of oil;
- mobilize clean-up team with equipment;
- arrange for fire services to stand by.

The following further managerial emergency actions concentrate on the site appraisal and determine combat strategy:

- assessment of safety, including probability of fire;
- placement of primary and secondary booms in appropriate positions;
- skimming and dispersing strategies;
- liaising with port authorities;
- calling out further assistance, including external resources, as necessary;
- ensuring smooth functioning of the emergency organization;
- when appropriate, terminating emergency condition and making arrangements for investigation and report.

#### 6.5 TEL/TML SPILLS

These organic lead compounds are highly toxic and may enter the body by ingestion, by absorption through the skin or by inhalation of the vapours. Protective measures adopted by operators in normal handling must be fully described in operating procedures. Furthermore, procedures should be available for handling small and large spills, while the emergency plans must cover hazardous situations that arise from large spills with and without fire, both On-site and in transit to the refinery.

Essential to the plan is the initial operations response, which should take the following form:

- raise the alarm, stop hot work, non-essential workers leave the area;

- don safety clothing, including breathing apparatus;
- evacuate the injured and arrange first aid;
- contain leakage and stop spill;
- use sandbags to dam the spilled compound;
- prevent compound from entering surface water drains or oily water systems;
- initiate removal and destruction of spilled compound with available chemicals.

The emergency procedures should cover the following additional considerations:

- use of sand or absorbent clay;
- if vapours present problems, blanketing of confined areas with water or foam may be desirable;
- further road blocks;
- disposal of contaminated equipment and materials;
- decontamination of the area.

In the case of a fire involving lead compounds, great caution must be exercised, as the fumes are highly toxic and the compounds are unstable above 100°C. Precautions include:

- firefighters properly attired and using breathing apparatus;
- use of dry powder or foam to prevent liquid spread into drains; otherwise, use water spray or fog;
- ensure protection of other lead compound storage vessels by water cooling.

The dispersion of these organic lead compounds would constitute a serious threat to the environment, since decontamination of the area would be increasingly difficult.

Any special arrangements made with the supplier of lead compounds should be mentioned in the procedures.

## 6.6 EMERGENCIES WITH NATURAL CAUSES

Refinery processing, storage and jetty facilities are normally designed to withstand the forces of natural occurrences characteristic of the locality. Nevertheless some systems may be

difficult or even impossible to operate safely under certain circumstances, e.g. earth quakes. Therefore, emergency plans and practice scenarios are prepared by refineries where certain natural occurrences are common. In the scenarios, factors such as poor communications, loss of utilities, disrupted logistics and life-threatening rescue difficulties should be considered.

Natural occurrences which can be expected are:

- heavy rainfalls and floods;
- high winds and hurricanes with associated high wave action;
- excessive snowfall and frost (icing);
- electrical storms;
- earthquakes.

Normally there is sufficient forewarning from weather stations of meteorological events. Any contingency actions will be based on weather forecasts for the locality and will reflect corporate priorities:

- safety of personnel;
- protection of the refinery facilities;
- minimum production loss.

The emergency plan should contain a comprehensive set of pre-determined instructions with which supervisory personnel are familiar. These will cover procedures for safeguarding facilities and personnel, medical treatment and evacuation.

Some general recommended actions are:

- to establish regular contact with the weather service;
- to establish distances from storm in order to execute preparatory actions in good time;
- to appraise the refinery operations/installations and consider the consequences the emergency may have on operations and personnel;
- to review all operations carefully to ensure that:
  - (1) No new operations are started if they might be critical.
  - (2) Construction work is stopped and facilities secured.
  - (3) Normal process/movements operations which might be in jeopardy are shut down (e.g. uncertain cooling water and power supply, flooded pump and compressor stations).

- (4) Jetties are safeguarded and tankers are moved into safe mooring/anchorage when predetermined levels of adverse weather conditions are forecast.
  - (5) Tanks and pipelines are firmly secured against floating and are kept as full as practical.
  - (6) Personnel are not assigned to duties which will require them to be at remote parts of the refinery where they might be endangered and rescue difficult to carry out.
- furthermore, to check whether the appropriate preconceived emergency procedures are available;
  - during the emergency the road and field situations are continuously appraised and actions updated.

Earthquakes cannot usually be forecast and therefore precautions immediately prior to such an event are not usually possible. Apart from some counter-measures to be taken in foreseeable cases, emergency plans cover activities after the event, and perhaps during if conditions allow. Emergency shutdown of facilities may be required. It is essential to make an immediate appraisal of the condition of the installations, with proper feedback to management for their consideration and decision as to the course of action for the refinery as a whole.

## 6.7

### EMERGENCIES CREATED BY THIRD PARTIES

Each refinery has its security services to monitor and enforce the company's rules and regulations. Additionally, security services aim to prevent crime and to apprehend intruders and offenders (in the broadest sense) who commit acts against the company and its personnel on its premises and waterfront. Deterrence is usually the main objective. However, there may be circumstances that require more extreme security measures and in those circumstances security emergency plans must be available which describe actions and counter-measures to be taken when the refinery is confronted by an imminent or actual security emergency. These plans should be made in cooperation with the appropriate local police authorities and treated as confidential. The types of possible events to be considered are:

- civil commotion, riot or revolution;
- terrorist action, inflicting damage to offices/installations, letter bombs/threats, kidnapping/hijacking, etc.

The security emergency plan may cover stages of alert including imminent and actual emergency. Procedures should describe:

- command and coordination structure;
- activation of security emergency services;
- alert of fire and medical service;
- alert of departmental managers/heads;
- procedures for informing/controlling personnel;
- arrangements with local police or other authorities with bomb disposal capability;
- security rules for telephone operators;
- handling mail;
- traffic control/road blocks/parking;
- personnel allowed to enter "Emergency Areas";
- communications;
- special teams well trained in emergency counter-measures;
- extra security patrol services;
- a "bomb search" plan;
- a "bomb discovered" plan.

In rare cases it may also be prudent to have a Potable Water Emergency Supply Plan, if any threat or risk of poisoning exists.

6.8

#### OCCURRENCES INVOLVING DEATH, SERIOUS INJURY, OR DAMAGE TO FACILITIES OR THE ENVIRONMENT

##### i) General

In most countries there is legislation applicable to these situations. All procedures and contingency plans to be applied must be consistent with the particular legal requirements.

The immediate warning mobilizes the medical emergency organization. Appraisal of the situation ensures that all required resources are being prepared, provided or are at hand.

ii) Rescue and Medical

It is the responsibility of the emergency organization to carry out the following actions promptly.

- rescue the injured and those trapped;
- set up an On-site first aid post;
- summon first aiders and auxiliary first aiders on emergency call lists;
- assemble ambulances at site and assembly point;
- prepare the clinic/first aid station or medical centre for the emergency;
- prepare temporary mortuary facilities;
- take injured personnel to the first aid station, clinic or local medical centre;
- make arrangements for outside doctors;
- establish communication systems;
- provide means of transport for casualties;
- obtain assistance from security/police services.

The plan must contain up-to-date lists of telephone numbers of doctors/specialists/own company services.

iii) Notification of Public and Family

Whenever grave incidents occur the public will need to be informed. Apart from the publicity, the families of casualties need to be informed and helped promptly. It may not be possible to have a standard method for informing next of kin but some general rules always apply:

It is essential that the next of kin of deceased or seriously injured personnel are notified at the earliest opportunity.

Prompt action is required by the doctor in providing an initial report.

Notification is on the basis of this report.

Any information provided to next of kin should be given in person, preferably by a doctor. A senior supervisor or manager known by the family and a social worker should help where necessary.

iv) Evacuation Plans

As indicated under Section 5.3, when limited response time is available during an emergency, the safest action, rather than evacuation, may be for people to take shelter in their houses in rooms facing away from the refinery, with windows, doors and curtains closed and with ventilation and fired heating systems shut down.

Nevertheless, plans for residential and refinery areas including process control centres may be important, depending on the nature of possible emergencies, e.g. rescue evacuation in cases of serious toxic gas release. The main points to consider in these plans are health and safety, escape routes and the logistics, such as forms of transport and vehicle drivers, for the particular cases.

Note: Also refer to CONCAWE MH/MG Guidance Note "Information to the Public" (see CONCAWE Report No. 11/87).

v) Work Resumption and Investigation

Sometimes work resumption at the site of a serious occurrence is not permitted without clearance by the appropriate authorities. Certain activities may be required so as not to endanger the lives of people and to restore safety to adjacent facilities. Particular care must be taken to ensure that evidence as to the cause and course of the occurrence is preserved. The Emergency Manager and other company officers will conduct a company investigation and report to management. Government authorities will carry out any legally required investigations.

7. TRAINING AND REHEARSALS

For the plan to be effective and for people to be prepared and to respond successfully to any prevailing emergency situation, training and exercises (supported by management) are essential. People must be trained in "skills" and "roles", both individually and in teams. Since staff movements regularly take place and since emergency occurrences are not routine, training for emergency action must (just as in routine job training) be "on-going". They should take into account the needs of the individuals and those of the company and its contingency plans. The training plan therefore comprises:

"Basics" training in all the elements of the plan. This training should include basic radio handling training.

"Skills" training in needs evaluation for the individuals involved in the contingency plan.

"Exercises" consisting of regular simulations of credible events, making them as realistic as possible.

The objectives of such a training plan are:

- (1) Familiarizing personnel involved in the plan with their equipment, the overall plans and their roles.
- (2) Familiarizing professionals (firefighters and medical personnel) from both Internal and External Support Services with special tactics and hazards, and enabling them to test their part of the plan. Medical Department should check periodically that all local hospitals are fully acquainted with procedures for special injuries, such as HF burns, H<sub>2</sub>S inhalation and bitumen burns.
- (3) Testing and reviewing the total plans, including communications and logistics, so that updating, modifying and training activities can be pursued.

The above elements of "knowing", "doing" and "functioning" are covered in integral training activities involving:

- workshops and discussions (classroom)
- emergency skills training (classroom + field)
- team drills and rehearsals (field)
- response rehearsals (field)
- selective call-out exercises (field)

i) Workshops

These are designed to cater for the specific needs of groups of personnel in the horizontal layers in the organization

Three types corresponding to specific levels of the plan are recommended:

Emergency Operations Workshops for Emergency Managers  
Emergency Response Workshops for appropriate Staff  
Emergency Actions Workshops for Site Supervisors.

Workshops for Emergency Managers cover the principles of the overall contingency plan, organization, communications, logistics, emergency site appraising, principles of firefighting/gas dispersion/oil spills clean-up/first aid, special emergencies and use of protective clothing/equipment.

Similarly, the Response Workshop for Staff deals with the same matters, but with the emphasis on those elements relevant to the level of their emergency tasks, e.g. principles of firefighting/gas dispersion/oil spill clean-up, first aid and emergency plant actions.

The Emergency Actions Workshop for Site Supervisors will emphasize relevant site activities, e.g. "First Response Actions".

ii) Emergency Skills Training

The elements to be covered in this package are the use of firefighting appliances, resuscitating casualties, the use of breathing apparatus and protective clothing and first aid.

iii) Team Drills and Rehearsals

These drills will contribute to team building while improving the functioning of the various teams comprising the Internal Control Service (ICS). Some examples of specific team activities that can be practised are firefighting training ground exercises, rescue and medical logistics, emergency shutdowns (simulated) and communications (radio) exercises.

iv) Response Rehearsals

This type of exercise is very useful to familiarize and practise response to emergencies. The exercises cover "realistic simulations of credible events", e.g. evacuation of buildings in the case of fire or toxic gas release, flammable/ toxic gas release (leak) in processing plants, tank farms or jetties, TEL/TML spills.

v) Selective Team Call-out Exercises

The exercises are meant to test communications, response times and logistics when these support services are called out.

Apart from the above, professionals and other selected key personnel should attend any courses/external training programmes (conducted by specialist institutions) deemed necessary to enhance their skills and aptitudes for the tasks they must perform.

Note: Further detailed information on training and rehearsal of emergencies is contained in CONCAWE paper "Training, Exercises and Rehearsal of Emergency Plans".

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