

emergency planning guidance note

- marketing installation emergency planning

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ABSTRACT

This guidance note highlights aspects that need to be considered when developing emergency plans for oil marketing installations in order to protect life, the environment and property. Whilst the note provides a framework, each operating location needs to make its own contingency plans suited to the local situation, legal requirements, and potential hazards.

Marketing installations vary greatly in size from large terminals to small distribution depots, so that the approach taken must be appropriate to the installation size and type, local resources and manning levels.

An emergency organization is shown, important company responsibilities described, and some typical actions for various emergency cases proposed. A description of potential events and consequences serves to illustrate possible courses of action.

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 effectiveness of the plan and the readiness of all personnel involved in the plan.

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1. INTRODUCTION

In spite of all precautions taken to ensure the safe design, operation and maintenance of plant in refineries and marketing terminals, from time to time accidents may occur. Fires, spills and releases of flammable or toxic materials can lead to serious consequences for both man and the environment unless quickly brought under control. Such accidents are possible during maintenance and construction work, as well as normal operations. In most cases the consequences of such accidents are confined to the area within the plant fence (On-site), but occasionally may also extend beyond the boundaries (Off-site). Planning must therefore take account of other people and organizations likely to become involved in the emergency.

The overall objectives of emergency planning may be summarized as follows:

- to contain and control emergency incidents
- to safeguard people On-site and Off-site
- to minimize damage to property and the environment.

CONCAWE has developed a series of guidance notes on emergency planning:

- "Content of emergency plans" (Report No. 5/88) presents an annotated reference list of items which need to be addressed.
- "Refinery emergency planning" (Report No. 6/88) provides a more comprehensive review of emergency organization.
- "Planning for Mutual Aid" (Report No. 5/88), "Training, exercises and rehearsals of emergency plans" and "Communications during emergencies" (Report No. 2/89) give further guidance on these key aspects of any emergency.
- "Selecting the incident scenarios", "Responsibilities of petroleum industry and regulatory authorities", and "Information to the public" (Report No. 11/87) cover those special aspects which apply to Off-site emergencies.

Together, these notes provide oil companies with comprehensive guidance on planning for emergency response. Although the types of event that can give rise to a major emergency can vary greatly, the consequences of potential accidents can be substantially reduced by having in place systematically prepared and thoroughly tested plans.

This CONCAWE note extends the scope of the guidance by providing advice specifically for use at oil marketing installations.

2. SCOPE

The oil industry processes, stores and distributes large quantities of flammable and highly flammable materials, including gasoline and liquefied petroleum gas. Refineries and major storage depots are therefore classified as hazardous installations within the provisions of the EC Directive on Major Accident Hazards of Certain Industrial Activities 82/501/EEC (known as the Seveso Directive) and related national legislation. The directive imposes obligations on these installations, including duties to set up emergency plans and to provide safety information to the public.

The Second Amendment, effective May 1990, requires additional information to be provided to the public. It also reduces the threshold quantities of hazardous substances in storage installations for which notifications are required (Articles 3 and 4), and for which safety reports are needed (Article 5), so that most European oil installations will come within the scope of the directive.

Marketing installations, however, differ from refineries in the following ways:

- Most products are handled at ambient temperature and pressure.
- Storage capacities of sites vary from very large to very small.
- Marketing sites do not always operate continuously during the working week.
- Manning levels are lower.
- Technical advice may be needed from outside the site.
- Marketing sites are often located in or near population centres.
- Marketing sites are more dependent on emergency services from local authorities.
- Although fixed fire-fighting systems (e.g. water ring main and tank deluge) may be installed, sites are often only equipped with portable fire-fighting apparatus.

Every installation needs to have a well-prepared emergency response plan. Factors such as size, location, regulatory obligations, manpower and resources, and capabilities available On-site and in the local area must be taken into account in all cases.

This document is aimed at hydrocarbon storage and distribution installations, whether road, rail, waterborne or pipeline fed. It also covers lube oil blending and grease manufacturing plant. It applies to installations, but not to transport emergencies Off-site (see Appendix 4).

The smallest capacity distribution terminals and depots may not fall within the scope of the Seveso Directive. Nevertheless, the principles outlined in this document are recommended in all cases as good practice in emergency planning, to be adapted to match the scale of the operation.

The guidance is designed to assist developing On-site and Off-site emergency plans by outlining a range of damaging occurrences, natural and man-made, that may impact on an installation. It provides basic checklists for developing action plans in local circumstances. Whilst the objectives are consistent, implementation can be adjusted to specific local conditions, and the type and size of the installation.

Furthermore, the guidance is intended to help identify staff needs for training in emergency response procedures, the degree of need for involving local authorities, and any special emergency planning requirements.

A secondary objective of emergency planning is the setting up of a post-event plan. Installations which suffer a major incident will need to have plans for clean-up, alternative means of fulfilling supply contracts and other means of mitigating the impact of the incident. Management should be ready to address these needs.

The responsibility for providing the first response to an emergency on site must always be that of the operating company. The severity of impact of an accident or incident may depend partly on the speed and effectiveness of those who are first on the scene, and companies should therefore be able to demonstrate to authorities 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). On- and Off-site plans need to be developed and, when necessary, implemented as a single coordinated plan.

3. TYPES OF EMERGENCY SITUATIONS

An emergency might arise in many ways, and it is likely that the underlying causes and factors that may contribute to escalation will be unique - for example, location, time-of-day, weather, and the effectiveness of emergency control.

In marketing installations the following general types of emergencies should be considered in developing response plans.

3.1 LOSS OF CONTAINMENT

Product spillages and gas releases can occur On-site and can usually be categorized in two ways:

- Minor spillages of liquid product that can immediately be dealt with by on-the-spot personnel.
- Large spillages of liquid product that require major containment and clean-up action to protect the environment, or leakage of gas. These events will have a potential for the formation of a significant volume of flammable vapour and therefore the risk of explosion and fire.

3.2 FIRES

Because of the flammable nature of petroleum products, fire is the major potential hazard for which emergency plans must be made. The development of hydrocarbon fires is usually very rapid and, to be successful, fire-control plans must therefore be capable of being implemented quickly and effectively.

3.3 MEDICAL EMERGENCIES

Medical emergencies involving serious personal injury may be generated by fire/spillage/gas release incidents, but can occur for other reasons - for example, falls, structural collapse, On-site vehicle accidents, asphyxiation, exposure to toxic or other hazardous substances.

3.4 NATURAL DISASTERS AND EXTERNAL EVENTS

Serious damage and injury may result from natural disasters or freak weather. Examples are lightning strike, storm, earthquake, flood.

External events such as civil disorder involving firearms and explosives should be considered in the preparation of an emergency plan, even if the probability of occurrence is estimated to be low. Likewise, sabotage and vandalism should be taken into account in vulnerable locations.

Other external events might include incidents occurring on adjacent industrial sites which might have an impact on the installation, or affect access to it. Accidents involving delivery vehicles may also call for emergency response from the site manager, and plans and resources for dealing with such emergencies will have to be made and rehearsed.

4.

SOURCES OF INFORMATION FOR PLANNING

The responsibility to preparing, developing and up-dating the emergency plan should be clearly identified within the site organization. The Installation Manager may of course, officially delegate this task to a subordinate, but should regularly review the details of the plan to ensure complete familiarity with them.

Much of the initial input to the plan will come from the installation management, since they are primarily responsible for the safe conduct of operations. At the local level, however, there are also three further groups of people who need to be involved during the development of the emergency plan if it is to prove effective in action. They are:

- The site workforce:

The people who work on the site, with their detailed on-the-spot knowledge and practical experience of operations, are best placed to assess what are likely to be realistic and practicable assumptions and expectations.

- The local authorities:

Consultation with local authority officials, emergency services officers, and leaders of the various other local bodies and organizations will provide comprehensive and up-to-date information on the range and location of resources that are available to deal with major emergencies.

- The local community:

People in the local community, and in premises neighbouring to the site, should be kept informed of the emergency plan so that they can respond appropriately if an incident should occur.

The objectives of the consultation process are to gain useful knowledge and to build bridges of understanding and cooperation between all the parties involved, in order to develop a unified and coordinated approach to emergency response planning and, in the event of an incident, effective implementation of the plans.

5. DEVELOPMENT OF THE PLAN

The installation emergency plan should define the roles and functions of company personnel during the course of an emergency and also define their functional relationship with the various emergency services which will be called to the site. Mainly for these reasons, the plan must be developed in close consultation with the emergency services.

A critical part of the plan will include the action to be taken by site staff immediately the emergency arises and prior to the arrival of the fire brigade, police, etc. This will also involve a call-in procedure for staff who may not be on duty at the time, but whose experience and technical expertise may be vital.

Especially at smaller installations, executive control during a major emergency will be in the hands of the external services such as the fire brigade or other local authority specialists, because the resources and expertise available at such sites are limited.

The usual statutory duties of the local authority fire service include maintaining a brigade adequate to handle normal domestic and industrial requirements. Where petroleum marketing activities are conducted in the area this normal cover may be inadequate to deal with a major emergency. In such cases consultation should take place with the fire service to establish what degree of assistance might be required from plant personnel and in the provision of utilities, e.g. fire-fighting water storage and associated pumping equipment. It is also recommended that key site personnel should undertake fire fighting training with the fire service, including use of the facilities of the marketing installation during rehearsals and exercises.

5.1 ANALYSIS OF THE REQUIREMENTS

The emergency plan is essentially an 'immediate-action' plan; for example, procedures must be documented and immediately accessible; up-to-date information on the assembly of emergency resources must be readily available. Prior to the preparation of a detailed plan for any particular site, an analysis of all relevant factors should be undertaken. The questions to be asked should include the following:

- Injury and damage:

What could be the possible nature and extent of injury, environmental and property damage for all credible emergency scenarios?

- Local emergency services:

What local emergency services will be available - fire, police, ambulance and hospitals? What is their capability to respond?

How will information on any special hazard relating to the emergency be passed to the police and fire brigade, so that they can adequately fulfil their roles in the implementation of the plan?

- Resource requirements:

What resources of manpower, equipment and facilities will be needed to control the likely range of On-site emergencies, to safeguard people and minimize the consequences? What types of equipment and procedures will be necessary to establish and maintain good communications between all the parties involved.

- Location and control of resources:

How many of these resources are readily available on site? Where are the rest located, how quickly can other equipment be mobilized and delivered to the site? Who controls the Off-site resources, what arrangements or authorities need to be set up to ensure their release when needed?

Will specialist contractors be required to deal with particular situations - for example, vehicle recovery and spillages?

- Mutual Aid:

Are Mutual Aid arrangements possible with other sites, companies or organizations?

- Other local factors:

What effects could there be from other factors such as weather changes, the need to contain spilled product/excess fire-fighting foam and water, crowd congestion, proximity of other sites/populated areas/waterways/railways/roads?

- Legal requirements:

What are the legal responsibilities of the company for emergency planning, rehearsal and liaison with the authorities?

- Protection of records

Have essential records - such as plans, drawings, inventories - been duplicated or otherwise protected against accidental loss and made readily accessible during an incident?

The questions should also be reviewed and the answers checked regularly to cater for changes both On- and Off-site.

5.2

THE ESSENTIAL ELEMENTS OF THE EMERGENCY PLAN

Once the analysis is complete, the details of the emergency plan can be assembled. Typically, the components of the plan should allow for the following actions:

- Activate the emergency alarm.
- Obtain immediate and precise information on the nature and extent of the emergency.
- Call out the emergency support services.
- Establish a suitable location for an Emergency Control Centre.
- Mobilize an emergency-control organization of a size appropriate to the seriousness of the incident.
- Allocate manpower resources to specific emergency tasks.
- Commence search and rescue.
- Identify casualties.
- Safeguard others and evacuate injured and non-essential personnel to a safe area.
- Control the incident using pre-planned actions, remove the hazard, prevent escalation.
- Minimize damage to property and the environment.
- Inform and collaborate with authorities and emergency services.
- Establish communications with the news media.
- Maintain welfare of emergency personnel.
- Inform and assist relatives of the injured.

- Keep detailed records of the incident.
- Protect the scene of the incident and preserve evidence.

Wherever possible, individual action plans should be drawn up to deal with the various types of event, particularly fires, which could occur at the installation. These specific plans will then fit within the general framework plan outlined above.

It is clear from the scope of these requirements that the emergency plan must provide for smooth information flow and cooperation with organizations in the community; this will not happen without prior consultation, regular rehearsals and constant updating of the plan.

6. THE EMERGENCY TEAM - ROLES AND RESPONSIBILITIES

The staffing levels of marketing operations vary greatly and it is inappropriate to try to define a standard organization for responding to emergencies. These guidelines therefore simply set out a framework of roles and responsibilities to be filled either by On-site personnel or by managers called in from elsewhere in the company e.g. Regional or Head Office. The roles described include those of 'Emergency Manager', 'Incident Controller', 'Medical Officer' and 'Fire Officer' as well as that of the person who witnesses the event and is first on the scene. If the situation develops into a major emergency, some of these roles will be taken up by outside professionals supported by the marketing operation's own emergency organization.

At small sites, the roles of Emergency Manager and Incident Controller will usually be merged.

6.1 PERSONNEL AT INCIDENT LOCATION

The response to the emergency will normally be initiated by a person at the scene of the incident. Clear instructions to carry out the following actions should be given to all staff and reinforced by means of prominent notices at suitable places on the site:

- Raise alarm; telephone emergency number and ensure that the Emergency Manager is informed.
- Stop loading/unloading and all other operations.

It could be possible that the person who detects the incident is the only person on site at that particular time. His primary tasks will be to call in extra help immediately, and to activate any automatic emergency shut-down systems which may be installed on the site.

Other tasks which staff may be able to carry out during the initial stages of the response include:

- Activate fixed protection equipment - for example, sprinkler systems, water curtains, fire monitors.
- Evacuate to a safe place persons who may be in danger.
- Carry out a roll-call to identify any missing persons.

- Commence initial rescue and fire-fighting, using appropriate equipment but without putting themselves at undue risk.
- Stop or minimize product flow if not already achieved.
- Isolate sources of leakage.
- In case of spillage or a gas leakage, eliminate sources of ignition.
- Alert site security to warn adjacent premises.
- Arrange for the emergency services personnel to be met at the site entrance. Direct them to appropriate areas and ensure that the Emergency Manager is informed of their arrival.

6.2

THE EMERGENCY MANAGER

Within the boundary fence of the installation, one person is usually designated as being responsible for the operation of the facilities. That person is normally the installation manager. Other personnel within the installation are subordinate to the manager who, in turn, will usually report to higher authority, such as at regional office and/or national headquarters.

The installation manager is generally responsible for health, safety and environmental matters, including emergency preparedness on the site. The installation manager will normally assume the role of Emergency Manager in the event of an incident, and should also ensure that a competent deputy is appointed to cover for absence on leave or business.

The installation manager is also the most appropriate person to interact with local authorities, community leaders and the news media representatives. Members of the public are most likely to turn for the information they need to this manager who must be prepared to respond to these enquiries. However, during an emergency, communication with the media and other outside groups should be delegated to some other competent person since the installation manager is likely to be fully occupied in controlling the situation.

Under the emergency plan, the Emergency Manager will establish overall coordination and control of the situation as early as possible, through the following actions:

- Assess the On-site situation, define or confirm the severity of the emergency and the potential for escalation.
- Consider best course of action.

- Activate relevant emergency call-out plan (in-house emergency team, fire-brigade, medical aid, Mutual Aid support, etc.).
- Set up the emergency control centre in the predetermined location. A forward control centre may subsequently be established under the direction of the Senior Fire Officer.
- Establish communication links with forward control centre and company headquarters.

The Emergency Manager should ensure that emergency role tasks have been directly allocated in the plan to specific staff as follows:

- Maintain a log of events and communications for the duration of the emergency.
- Ensure that medical facilities are made available.
- Arrange for personnel headcount, and site searches if necessary.
- Achieve operational containment, for example, by isolating sources of leakage, and prevent ignition of flammable releases.
- Establish control of vehicle movement to and from the site.
- Liaise with external services as they arrive at the site - fire brigade, ambulance service, police and other authorities.
- Ensure coordination of Mutual Aid support.
- Arrange for relief of personnel as necessary.
- Ensure general support services available - for example, catering, communications, weather reports.
- Arrange with the Police for information/support to relatives of casualties and missing persons.
- Prepare news statements together with personnel and public relations officers for approval by appropriate senior management.
- Ensure evidence and records are preserved for use in investigations.

The installation manager will also need to allocate responsibilities for actions to be taken after proper control of the emergency has been established. These will include:

- Initiate post-event plan.
- Arrange for a comprehensive investigation of the events leading to the emergency and an assessment of the response; prepare report for management.

6.3

INCIDENT CONTROLLER

The Incident Controller reports to the Emergency Manager. The Controller has direct charge of operational containment actions, and has overall responsibility for the integration of fire-fighting and related operational actions. Specific duties under the plan are to:

- Ensure initiation of measures such as isolation of leakage sources, emergency shutdown of plant, operation of plant-protection equipment - for example, water-deluge and foam protection systems.
- Oversee the initial execution of fire-fighting operations.
- Ensure the continuity of essential utilities and services as far as circumstances will permit, e.g. water, electric power.
- Ensure water supply and fire-pump performance is continuously monitored.
- Oversee initial stages of the rescue of injured and trapped personnel.
- Coordinate initial evacuation of personnel from site.
- Ensure that life-support and protective equipment is used as needed.
- Keep the Emergency Manager aware of progress of emergency actions and any requirements; also of existing or potential hazards that may bear on incident-control tactics - for example, gas release, overflowing drains, structural collapse, possible escalation to involve other storage.
- Coordinate as appropriate with rail and/or harbour authorities on rail and/or marine emergency measures - for example, stopping rail movements close to the site, evacuating full/empty rolling stock from the depot if exposed to danger, deberthing of tankers or barges.

- Supervise post-emergency actions on the site.

6.4 FIRE OFFICER

The responsibilities of the Fire Officer are to:

- Rescue the trapped and injured using tactics decided in consultation with the Emergency Manager and Incident Controller.
- Execute the relevant predetermined fire-fighting plan - or in the absence of such a plan, decide the strategy and tactics for fighting active fires - in consultation with the Emergency Manager and Incident Controller.
- Decide, with the Incident Controller, on tactics for handling gas releases - preventing ignition/explosion, dispersing the cloud and protection of personnel.
- Organize the deployment of fire tenders and equipment.
- Monitor foam stocks and inform Emergency Manager of additional needs.
- Ensure adequate fire-fighting water is available.
- Protect shore facilities when there is a tanker or barge fire alongside.
- Inform Incident Controller and Emergency Manager of progress of rescue and fire-combat operations.

During a fire, the senior local authority Fire Officer present is likely to assume command of the situation for fire-fighting and rescue. Site management, who would otherwise be in control, will then relinquish this responsibility, but it is normal for the company's officer to make available specialist knowledge in an advisory capacity.

6.5 MEDICAL OFFICER

The Medical Officer may be the company's doctor, reporting to the Emergency Manager, or the local authority's duty medical officer. Responsibilities are to:

- Take direct charge of medical assistance at the scene.

- Provide medical supplies for first-aid, including dressings or materials to cater for special hazards associated with the site's operations.
- Ensure that casualties are taken to the first-aid station, that proper treatment is given and, if necessary, arrange hospitalization.
- Inform the Emergency Manager if external help is required e.g. additional medical personnel, supplies, transport.
- Liaise with other medical services On-site and Off-site e.g. ambulance services, hospitals, laboratories.

6.6 POLICE

In the event of a major emergency, the Police will initially follow standing operational procedures designed to provide a sufficient and effective response to minimize danger to life, property, and the environment.

The Police may then assume the role of coordinating the emergency activities, and each of the other emergency services will have its own special responsibility in support.

The Police may also have statutory duties to perform such as traffic control, evacuation of the local community, protection of property against looting, identification of any dead and the setting up of mortuaries.

During an emergency the police will also undertake responsibility for informing relatives of casualties, dealing with enquiries, and controlling sightseers.

Should the emergency be the result of any form of criminal action or involve a road traffic accident, the police would also have a statutory involvement in any investigation.

6.7 LOCAL AUTHORITY

Depending upon the severity of the emergency, the local authority will need to be advised in order to make decisions about activating the appropriate response for the Off-site emergency plan.

7. TRAINING, REHEARSALS AND EXERCISES

In order to ensure that the emergency plan will work effectively, it will be necessary to prepare all the people who are involved in the various aspects of the plan through training, exercises and rehearsal. These requirements should be included in the general safety policy for the site, to emphasise their importance to the site's overall operations, and to demonstrate commitment by senior management.

In some countries, the frequency of training and fire-fighting drills for emergency services personnel is controlled by legislation. Annual emergency exercises involving site personnel, the local authority emergency services and local communities may also be officially regulated. In all cases, however, regular reviews and rehearsals of emergency plans are necessary to maintain a state of readiness of the emergency teams and to enable them to respond adequately to any situation.

The various parts of an emergency plan can be tested independently in advance of a full-scale rehearsal. Examples are:

- Selected emergency scenarios.
- Communications systems.
- Liaison with local fire services.
- Speed of mobilization of emergency teams.
- Search, rescue and casualty treatment procedures.

Any faults in these areas and other difficulties such as access problems, inadequate fire-fighting water supplies, and poor definition of the roles of the participants would be exposed by rehearsal of the plan. Corrective action can then be taken.

Wherever possible, observers should be placed at strategic points around the site when an exercise is taking place. Feedback of information can then be used to refine and improve the plan. A debriefing session should be held to allow discussion between the participants, emergency services and observers so that the deficiencies can be noted and rectified. Information gained from knowledge of previous real emergencies can also be used to help make the plan as effective as possible. There is a great advantage to be obtained in allowing the emergency teams and the external services, including Mutual Aid teams where appropriate, to work together and get to know each other. Similarly, familiarization visits by the external services to the site will help them to know the site layout and the nature of potential hazards.

APPENDIX 1 FIRES AND EXPLOSIONS

The flammable nature of the products handled in marketing installations means that fire is an ever-present hazard during operations. Emergency response plans must be drawn up to take into account all credible fire situations which might arise as a consequence of the loss of containment of product.

Planning should consider the strategic resource requirements including manpower, apparatus, fire-fighting media (water, foam etc.), and also the fire-fighting tactics which might be needed to tackle each type of fire envisaged. For example, in many cases of fire involving leakage, control can quickly be achieved by isolating the leak or depressurising the source so as to starve the fire of fuel. In some circumstances, particularly those involving LPG, it may not be possible to isolate the source of fuel immediately. A better approach in such a case may be to allow the fire to continue to burn in a controlled manner while cooling adjacent vessels as necessary. This will reduce the risk of explosion should the leaking vapour reignite.

Proper pre-planning of tactics such as these is essential for establishing swift control of a fire and preventing escalation of the emergency.

GENERAL PRINCIPLES OF THE FIRE-FIGHTING PLAN

A range of plans should be prepared to cover typical fires which might occur at the installation concerned. The following checklist contains some examples of general matters which should be considered in relation to each possible event:

- What manpower resources are normally available on the site? What is their level of training in first-response fire-fighting and what additional training is necessary?
- How might people be rescued if they are trapped? What rescue equipment may be needed and how can people be trained to use it?
- What measures will be necessary to stop product flow and isolate tankage and pipework?
- Where can mobile fire-fighting appliances be located on the site, and is the access to these locations adequate? Have the local brigade and Mutual Aid partners been informed?
- What equipment or materials (sandbags etc.) might be needed to control the spread of spilled liquids and prevent flow into surface-water drains?

PLANNING THE INITIAL RESPONSE TO THE FIRE

The first few moments of any fire outbreak are likely to produce confusion. The Emergency Manager will therefore need to carry out a rapid and systematic assessment so that he can bring the relevant fire-fighting plan into action as quickly as possible. The key points to be assessed will be:

- What is the location, nature and extent of the outbreak and the potential for escalation?
- Which buildings, plant and equipment are involved?
- What is the source of fuel for the fire and can it be isolated?
- Are there any casualties?
- Are there any missing persons?

Once this initial information has been obtained, the Emergency Manager can decide on the relevant pre-planned response. Actions such as the following will need to be taken as quickly as possible:

- Activate water curtains, fire monitors and sprinkler systems in the immediate vicinity.
- Carry out emergency shutdown of pumps and other equipment.
- Shut off the source of fuel if possible, without endangering personnel.
- Extinguish the fire with portable equipment if possible, but beware of the risk of re-ignition of gas and vapour clouds.
- Deploy the appropriate fire-fighting foam.
- Remove hazardous materials and loaded vehicles from the vicinity.
- Cool plant, particularly the vapour space of LPG vessels, adjacent to the fire using fixed or portable systems. LPG vessels should not be emptied.
- Isolate ventilation to confined spaces which may be affected, for example control rooms, pump houses.

Flow of burning liquid may threaten to escalate the incident very rapidly. Swift action will be necessary to:

- Prevent the spread of fire through drains, using sandbags to temporarily divert water flow.
- Avoid overflow of tanks and vessels caused by water injection.
- Avoid overflow of bunds caused by water-filling.
- Prevent the spread of fire across surface water.

Tactical planning matters such as those listed above should, if possible, be discussed in detail with the local brigade which is likely to be involved in fighting the fire, so that resource requirements can be anticipated well in advance of any emergency.

END OF THE FIRE EMERGENCY

Once the fire has been extinguished, control of the situation should be confirmed through the following actions:

- Prevent re-ignition of spilled fuel by maintaining covering foam.
- Check that there is no continuing release of flammable or combustible materials.
- Keep fire and other emergency services/equipment on stand-by.
- Continue to cool down as necessary.
- Check for the presence of toxic vapours.
- Maintain entry restrictions.
- Check for the possibility of structural collapse.
- Safeguard the surrounding area.
- Check safety conditions in other parts of the site.
- Give the "all clear" signal to permit normal operations to be resumed elsewhere on site if possible.
- Inform the surrounding area of the "all clear" status of the site.

APPENDIX 2 SPILLAGE AT A LOADING GANTRY

Spillages at road and rail loading gantries can vary from relatively minor leakage of a few litres of product to major overflows. Each however, has the potential for developing into a major incident. The following precautions are essential in any plan for dealing with spillage:

- Actuate emergency alarm signal to bring emergency plan into operation.
- Stop all pumping and vehicle loading operations.
- Establish source, nature, and extent of spillage.
- Stop all vehicle movement in the loading gantry area.
- Isolate any other sources of ignition.
- Mobilize portable fire-fighting equipment to scene of spillage.
- If immediate risk of fire, call fire brigade.
- Cover spilt product by an application of foam.
- Evacuate non-essential personnel to a safe place.
- Stop any product movement and any other operations which could increase fire hazard.
- Call police if there is a risk to adjacent property.
- Check interceptors for spilt product and close control valves as necessary.
- Inform local water authority of potential pollution risk where relevant.
- Prevent further spillage or leakage. If appropriate, pump water into leaking lines to displace product from point of leakage.
- Use sand, if necessary, to dam the spillage area.
- When fire risk has been dealt with to the satisfaction of the fire brigade, confine and pick up spilt product.

APPENDIX 3 INCIDENTS INVOLVING LPG

1. PREVENTION

Liquified petroleum gas (LPG) is normally stored and handled as a liquid under pressure (it can be handled as a refrigerated product at virtually atmospheric pressure). If leakage occurs, it will result in the release of liquid or vapour, depending on the contents at the location of the leak. Under most atmospheric conditions, escaping liquid LPG boils violently, forming a vapour cloud (one volume of liquid forms about 250 volumes of vapour).

These characteristics mean that it is essential to ensure the integrity of LPG containment systems at all times. Methods used include strict adherence to recognized design codes, hazard studies to eliminate design faults, preparation of safe operation and maintenance procedures, and good training of operations personnel.

Despite the most rigorous precautions, escape of LPG can occur, sometimes as the result of equipment failure, but more often as a consequence of human error. Site management must therefore ensure that adequate emergency systems and procedures are in place at all times, and that all site personnel are properly trained to respond quickly and effectively.

2. BASIC ACTIONS

The basic actions in any emergency involving LPG are as follows:

- Ascertain the nature of the emergency.
- Raise the alarm to activate the emergency response.
- Shut down all operations, muster personnel and evacuate those not needed for emergency action.
- Isolate the affected part of the installation if possible, to limit the spread of leaking or burning product.
- Remove any mobile equipment at risk (without starting engines in a gas-affected area), ensuring that access routes are not blocked.
- In cases of product leakage, eliminate all sources of ignition in areas affected or likely to be affected.

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- Assess the magnitude of the emergency as soon as possible, taking into account that LPG vapour clouds are a serious hazard until safely dispersed.
 - Contact local public emergency services for assistance if required, e.g. fire, police, ambulance. Ensure that neighbours and local authorities are informed as necessary.
 - Approach sources of leakage and vapour clouds from upwind.
 - Use fire-fighting water jets which induce air movement, to deflect, disperse and dilute vapour clouds.
 - Provide water-hose operators with protective clothing (they must remain outside the vapour cloud) and a water spray, as a precaution against the effects of accidental ignition of the vapour.

ACTION IN THE EVENT OF FIRE

Immediate action is the most important factor in fire control. The first few minutes count, as fires develop and spread very quickly unless prompt and efficient action is taken.

In the event of a fire within an LPG plant, the following actions should be taken as quickly as possible:

- The fire alarm should be sounded immediately by the person discovering the fire, who should report quickly to the switchboard/fire control centre the location of the fire, giving an estimate of its size.
- The fire pump should be started, or other arrangements made to ensure that the fire-water main is supplied with water.
- The fixed water sprinkler system should be started on all vessels which are involved in the fire or exposed to radiant heat.
- The fire-water main should be manned, running out hoses as required.
- Stop all loading, filling and discharge operations in the immediate vicinity. If the fire is at or near filling/discharge points, the transport unit involved must be disconnected/moved to a safe area as quickly as possible, without blocking access routes.
- All pumps, compressors, etc. should be stopped, and valves on product lines, manifolds and tanks in the affected area should be closed.

- Cylinders and other portable containers and equipment exposed to the fire should be moved to a safe location if this can be done without serious danger to personnel.
- Vehicles should be withdrawn from the plant in an orderly and safe manner, and parked in a location where they will not interfere with fire fighting and other emergency services.

If possible, the LPG flow should be isolated near to the point of leakage, and allowed to burn out. Adjacent facilities must be protected as far as is practicable by means of water jets from hoses or fixed monitors. For this purpose fire fighters must be well trained, equipped with protective clothing, supplied with suitable fire-fighting equipment, and be well led.

The most important aspects of containment and protection are:

- Before committing people to contain the fire, assess the safety of the situation.
- LPG vessels exposed to flame impingement must be thoroughly and continuously cooled over the whole surface (particularly the vapour space) by means of their fixed water-spray systems, supplemented by hose streams if necessary. National fire codes often specify the required rate of water application. If water is not applied in this way, the parts of the vessel surface which are above the internal liquid level can rapidly overheat and lose strength, leading to catastrophic failure under pressure.
- Fire-fighting efforts must take place at the maximum possible distance from the exposed vessel(s), in order to reduce the possibility of injury to fire-fighters in the event of an explosion and fire-ball.
- Supporting structures directly exposed to flame or high levels of radiant heat should be protected by water spray to prevent collapse.
- LPG vessels are provided with pressure relief valves designed to relieve excess pressure developed, for example, as a result of exposure to fire. When hose streams are directed on to vessels, the operation of pressure relief valves should not be hindered.

APPENDIX 4 REFERENCES TO GUIDANCE ON TRANSPORT EMERGENCIES OFF-SITE

1. ILO (1988) Major hazard control - a practical manual. An ILO contribution to the International Programme on Chemical Safety of UNEP. Geneva: International Labour Organisation
2. API (1984) Developing a highway emergency response plan for incidents involving hazardous materials. Washington DC: American Petroleum Institute
3. CIA (1986) Chemical industry scheme for assistance in freight emergencies. Chemsafe - 1986. London: Chemical Industries Association
4. Fire Brigades Advisory Council (1987). Emergency action codes and supplementary information for dealing with incidents involving dangerous materials conveyed in bulk by road or rail. - HAZCHEM LIST No. 5. Harwell: National Chemical Emergency Centre/The Home Office
5. Health and Safety Commission (1988) Approved substance identification numbers, emergency action codes and classifications for dangerous substances conveyed in road tankers and tank containers - APPROVED LIST, 3rd ed. London: HMSO
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